Clemson University
3 1604 018 748 295

Clemson University
3 1604 019 672 874

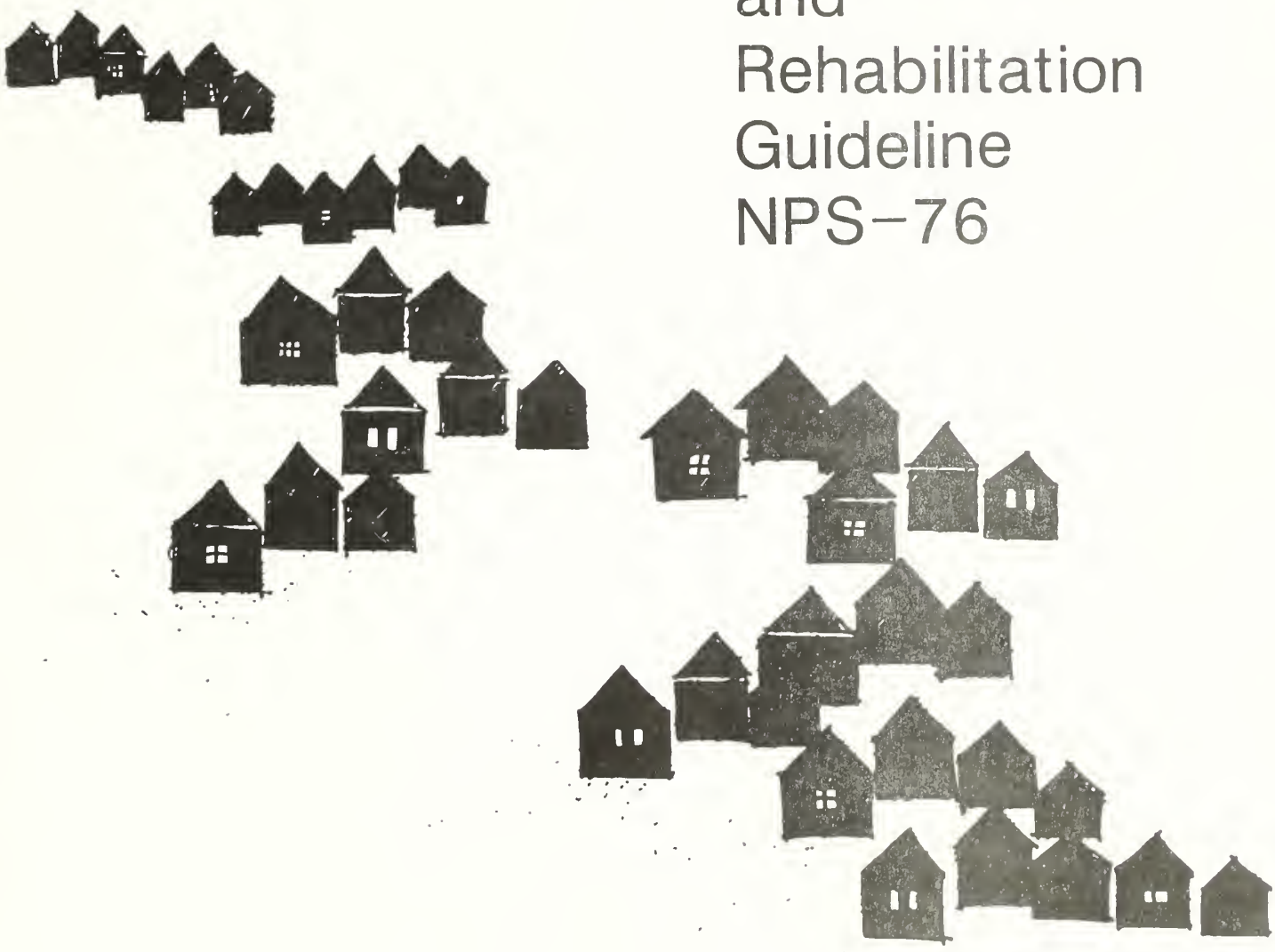
PUBL... ...ENTS
DEPOS... ...ITEM

OCT 5 1988

CLEMSON
LIBRARY

NATIONAL PARK SERVICE

Housing Design and Rehabilitation Guideline NPS-76



UNITED STATES
DEPARTMENT OF
THE INTERIOR

We must continue to deal equitably and forcefully with the needs and demands for staff housing, both from the employee's viewpoint and requirements of management.

We must remember that although the employee is living in government housing, it is still his or her castle, and we as managers must be sensitive to the needs of the employees and requirements of the Service.

Wm. Penn Mott, Jr.

INTRODUCTION

The "National Park Service Housing Design and Rehabilitation Guideline" (NPS-76) has been prepared to assist in the planning and design decisions affecting park housing.

The need for park housing is fundamental to the management purposes of the Park Service--to achieve stewardship and protect the resources. The quality of park housing, however, influences both the overall visual quality of the park scene and the quality of life for park employees and their families. Accordingly, the design and rehabilitation of park housing must demonstrate NPS philosophy concerning the condition of the landscape, the overall design quality, and the maintenance of the built environment as well as concern for the living conditions of the employees caring for our parks.

PURPOSE

It is not the intent of NPS-76 to

replace the services of trained design professionals,

by-pass the need to utilize established comprehensive design processes,

substitute for the technical references essential to good design,

impose a generic housing standard on management or residents, or

promote minimum standards as the desired or maximum expectation for NPS housing.

NPS-76 is intended to establish a foundation of common information for those participating in the improvement of park housing--the managers, planners, designers, users, inspectors, builders, and financial backers. Accordingly NPS-76 provides a summary/overview of the policies, regulations, planning principles, design guides, user preferences, inspection requirements, building standards, and cost estimating information applicable to park housing. NPS-76 will be a dynamic document; as new or more helpful housing information becomes available, revisions will be issued.

SECTION FORMAT

The "NPS Housing Design and Rehabilitation Guideline" is formatted into the following three sections:

REGULATIONS - the requirements for management, accountability, appropriateness, accessibility, safety, and energy efficiency

DESIGN - the basic considerations for improving livability, compatibility, maintainability, and durability

REHABILITATION - the requirements for the inspection, evaluation, quantification, and rehabilitation of existing housing including historic buildings

In using NPS-76, please keep in mind that the three sections are interrelated. Figure 1 illustrates that the regulations and design guidelines have application whether new housing is provided or existing housing is upgraded. The regulations and design guides must be considered in any new construction and should be considered to the greatest extent feasible in rehabilitation projects given the physical, cultural, and economic constraints.

Chapter Format

All tabs for individual chapters within a section are color matched. The level of application for the individual chapters will vary based on the type of housing project and is graphically presented in figure 2. When possible and appropriate, a checklist printed on colored paper introduces the chapter with a summary of the essential material.

References

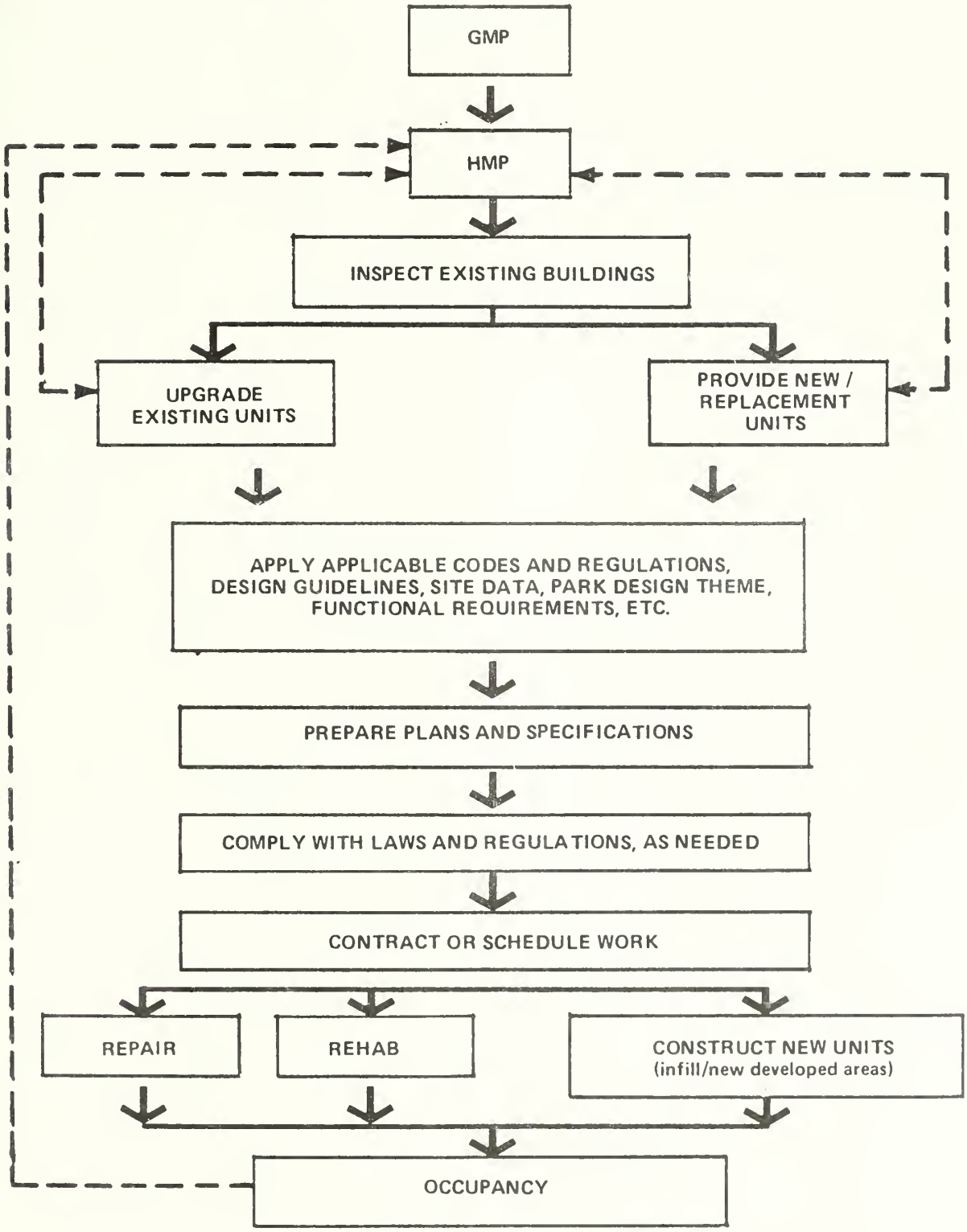
A listing of the information sources used in preparing NPS-76 as well as other excellent references related to housing can be found at the back of this document.

For visitors the quality of the built environment in our parks is a reflection of how well we perform our stewardship responsibilities.

For occupants the quality of the built environment they are asked to live in will be reflected in the performance of their stewardship responsibilities.

Figure 1

Process for Construction/Rehabilitation of NPS Housing


GMP
HMP
INSPECT EXISTING BUILDINGS
UPGRADE EXISTING UNITS
PROVIDE NEW / REPLACEMENT UNITS
APPLY APPLICABLE CODES AND REGULATIONS, DESIGN GUIDELINES, SITE DATA, PARK DESIGN THEME, FUNCTIONAL REQUIREMENTS, ETC.
PREPARE PLANS AND SPECIFICATIONS
COMPLY WITH LAWS AND REGULATIONS, AS NEEDED
CONTRACT OR SCHEDULE WORK
REPAIR
REHAB
CONSTRUCT NEW UNITS (infill/new developed areas)
OCCUPANCY

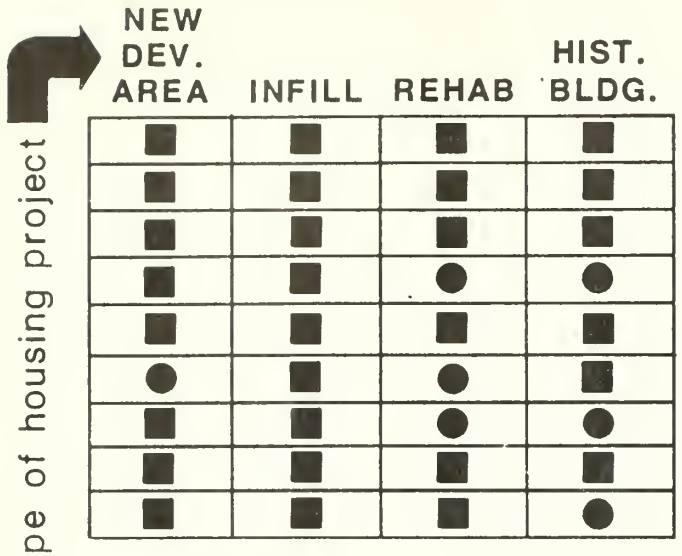
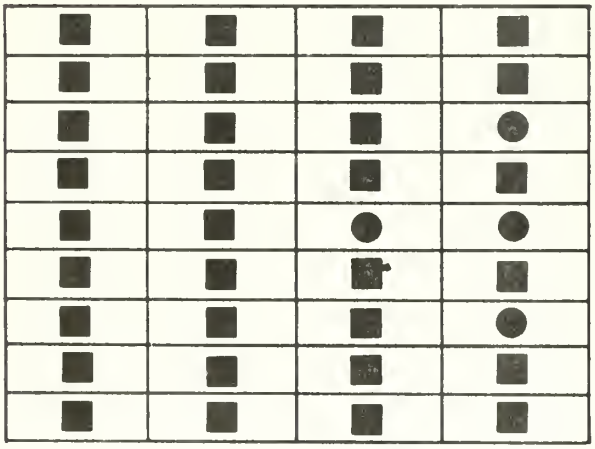


Figure 2

Application of NPS-76 chapters based on type of housing project

REGULATIONS

SPECIAL DIRECTIVE
NPS PLANNING DOCUMENTS
NPS-36
OMB CIRCULAR A-18
BUILDING CODE
HISTORIC PRESERVATION
NEPA COMPLIANCE
ACCESSIBILITY
ENERGY CONSERVATION

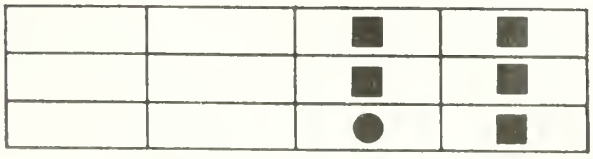


DESIGN

PARK DESIGN THEMES
SITE DESIGN
UNIT DESIGN
EMPLOYEE DESIGN PREFERENCES
CLIMATIC DESIGN
BUILDING MATERIALS
COST ANALYSIS
FUNDING SOURCES
SPECIFICATIONS

REHABILITATION

GENERAL CONSIDERATIONS
HOUSING INSPECTION
HISTORIC BUILDINGS



■ PRIMARY
● SECONDARY

REGULATIONS

SPECIAL DIRECTIVE
NPS PLANNING DOCUMENTS
NPS-36
OMB CIRCULAR A-18
BUILDING CODE
HISTORIC PRESERVATION
NEPA COMPLIANCE
ACCESSIBILITY
ENERGY CONSERVATION

DESIGN

PARK DESIGN THEMES
SITE DESIGN
UNIT DESIGN
EMPLOYEE DESIGN PREFERENCES
CLIMATIC DESIGN
BUILDING MATERIALS
COST ANALYSIS
FUNDING SOURCES
SPECIFICATIONS

REHABILITATON

GENERAL CONSIDERATIONS
HOUSING INSPECTION
HISTORIC BUILDINGS

CONTENTS

REGULATIONS SECTION

- Special Directive 88-4
- NPS Planning Documents
- NPS-36
- OMB Circular A-18
- Building Code
  - Checklist
  - CABO
  - UBC
  - UCBC
  - NFPA 101
  - NPS-50, Loss Control Management Program Guideline
- Historic Preservation
  - Use of Historic Structures for Housing
    - Section 106 Compliance Procedures
    - Policies and Guidelines
    - Standards
    - Definitions
- NEPA Compliance
  - Replacement Housing
  - Construction Involving New Sites
- Accessibility
  - Checklist
  - Uniform Federal Accessibility Standards (partial)
- Energy Conservation
  - Checklist
  - CABO Model Energy Code
  - DOE Mandatory Energy Conservation Standards for New Federal Residential Buildings

DESIGN SECTION

- Park Design Themes
  - Design Theme Characteristics
  - Design Criteria for Infill
- Site Design
  - General Site Considerations
  - Site Resource Analysis
  - Site Design Principles

- Unit Design
  - Basic Unit Design Checklist
  - Living Room Checklist
  - Dining Room Checklist
  - Kitchen Checklist
  - Bathroom Checklist
  - Bedroom Checklist
  - Closets and Storage Checklist
  - Laundry Checklist
- Employee Design Preferences
  - Seasonal Employees
  - Permanent Employees
- Climatic Design
  - Regional Guidelines for Building Passive Energy-Conserving Homes
  - Northeast
  - North
  - Midwest
  - Great Plains
  - Mountainous
  - Northwest Coast
  - Southwest Coast
  - Mid-Atlantic Coast
  - Appalachian
  - Mississippi Valley Region
  - Southwest Desert
  - West Texas Area
  - North Texas Area
  - Gulf Coast
  - Bayou Coast
  - Tropics
  - Alaska
- Building Materials
  - CSI Divisions 1-16
- Cost Analysis
  - Estimating Cost for Legislative Support Data
  - Class "C" Estimating, Regular Construction Manual
  - Class "C" Estimating, Historic Preservation and Stabilization Manual
- Funding Sources
  - Housing Program Funding Sources
  - Application of Housing Funding Sources
- Specifications
  - MASTERSPEC Index
  - NPS Guide Specifications Index

REHABILITATION SECTION

- General Considerations
- Housing Inspection
  - Instructions on How to Fill Out a Housing Inspection Checklist
  - Summary and Detailed Checklists
    - A. Site--Summary and Detailed Checklists
    - B. Exterior Envelope--Summary and Detailed Checklists
    - C. Accessibility--Summary and Detailed Checklists
    - D. Public Health--Summary and Detailed Checklists
    - E. Fire/Life Safety--Summary and Detailed Checklists
    - F. Interior Envelope--Summary and Detailed Checklists
    - G. Electrical--Summary and Detailed Checklists
    - H. Heating/Ventilating/Air-Conditioning--Summary and Detailed Checklists
    - I. Plumbing/Utility--Summary and Detailed Checklists
    - J. Function--Summary and Detailed Checklists
    - K. Other Features
- Historic Buildings
  - Introduction
  - Portions of the "Guidelines for Rehabilitating Historic Buildings"

REFERENCES

United States Department of the Interior

NATIONAL PARK SERVICE
P.O. BOX 37127
WASHINGTON, D.C. 20013-7127

IN REPLY REFER TO:
F7423(610)

JUL 12 1988

Special Directive 88 - 4 (REVISED)

Memorandum

To: Directorate, Field Directorate, WASO Division Chiefs and All Park Superintendents

From: Director

Subject: Employee Housing - Design and Rehabilitation

As stated in my memorandum dated April 16, 1987, I appointed a Housing Oversight Committee to provide Servicewide direction as to the proper design, quality, and kind of housing that would be built for each park unit. The purposes of this Special Directive are to ensure that quality, well designed, long-term housing facilities with full-life cycle cost considerations will be properly constructed, rehabilitated, and maintained. NPS-76, Housing Design and Rehabilitation Guideline, has been developed by members of the Housing Oversight Committee. This Guideline defines the process and the responsibilities of managers for employee housing, applies to ongoing housing management programs, as well as any special initiative, or other construction or repair housing activities.

GOALS - The goals of the NPS Housing Initiative are to continue to deal equitably and forcefully with the needs and demands for staff housing, both from the employee's viewpoint and the requirements of management. We must remember that although the employee is living in Government housing, it is still his or her castle, and we as managers must be sensitive to the needs of the employees and the requirements of the Service. As stated in the Service's Employee Housing Initiative Report, housing is a long-term investment for the Service, and while it should not be ostentatious, it should be built to last and should be capable of being maintained with reasonable cost-effective procedures. Quality, energy-efficient structures cost less to maintain. The condition of employee housing has a significant impact on the morale and productivity of the work force. By building quality structures, we can reduce maintenance costs and in all likelihood improve both employee morale and production.

A. HOUSING UNIT DESIGN ASSISTANCE TEAMS (HUDAT) - The Regional HUDAT will serve as a technical and management advisory group to provide assistance onsite to park areas. In addition, I am requesting that large parks that have 50 or more housing units supplement the Regional HUDAT with design professionals. These parks normally have a professional staff available, i.e., Historical Architect, Architect, Landscape Architect, or Engineer. Park areas that have a large number of historic structures available for park housing should also supplement the Regional HUDAT with a Historical Architect. These professionals should be appointed as soon as possible, but no later than August 5, 1988, in order that arrangements can be made for appropriate training. Please submit their names and titles to the Housing Oversight Committee Chair, Robert Lopenske, as soon as they have been appointed.

The tasks of HUDAT will be to:

1. Assist park managers in applying the new housing design standards.

2. Complete or assist in the completion of housing inspection checklists and cost estimates.

3. Review planning and compliance documents that affect housing.

4. Assist in developing and reviewing plans, specifications, and bidding documents for housing rehabilitation projects.

5. Evaluate results of all new housing and housing rehabilitation projects.

B. NPS-76, HOUSING DESIGN AND REHABILITATION GUIDELINE - This Guideline prescribes the Service's procedures governing the construction and rehabilitation of all housing within any unit of the National Park System, including concession housing. This supplements the policies and practices set forth in Office of Management and Budget (OMB) Circular A-18, Interior Property Regulations 114-51 and 114-52, and the Departmental Quarters Handbook, 400 DM. The main objective of this Guideline is to provide quality housing that will be harmonious with the park theme and environment, and cost-effective to maintain.

NPS-76, in compliance with OMB Circular A-18, requires that all future housing in the National Park System comply with the following parameters:

1. Livability - Housing should be a usable design. Designs are to be developed, as appropriate, for families (with and without children), single employees, and for both seasonal and permanent employees.

2. Compatibility - All housing must be designed to be harmonious with the park theme and environment.

3. Maintainability - Housing must be of quality construction as set forth in NPS-76. This will decrease costs and provide better housing for employees.

4. Energy Efficient - All units must be designed to conserve energy. Unit and site design should take advantage of passive strategies to capitalize on climate assets and to minimize climate liabilities.

5. Durability - Housing designs will address the issue of withstanding the extreme weather conditions and normal heavy rental use common to park areas.

6. Flexibility - Housing will be designed and constructed to allow flexibility for both management and the user. Units should permit some adaptability to the user's needs, and changing needs of management.

7. Accountability - Management will comply with these and other regulations in administering the housing program. In addition, managers will be held accountable for the life cycle cost analysis, as well as proper maintenance and upkeep of all units.

C. USE OF HISTORIC PROPERTIES - In many instances it may be to the advantage of the Service to use existing historic buildings instead of constructing new housing. Section 110(a)(1) of the National Historic Preservation Act directs all Federal agencies, including the Service, to use available historic buildings to the maximum extent feasible prior to acquiring or constructing new buildings for purposes of carrying out Agency responsibilities. But beyond the law, using historic buildings for housing or other purposes makes good sense, given our mission to preserve and protect. Many historic buildings can be adapted to meet the needs of modern living while retaining their architectural and historic character. In addition, historic buildings were often designed to be compatible with the park theme and environment, and may set a standard of excellence for the design of new buildings that are needed.

To determine when it is appropriate to use a historic structure for housing, Park Management must consider whether a given historic structure can be rehabilitated to meet housing standards without adversely affecting its historic character and if the rehabilitated structure will meet a need identified in the Park Housing Management Plan.

Regional Cultural Resource Specialists shall be given the opportunity to review and comment on the Park Housing Management Plan and specific unit plans. Each "Justification - For New or Replacement Housing, Form 10-373" shall include documentation that underused or vacant historic structures are not available for use or explanation of the decision not to use them.

D. NEW CONSTRUCTION - All line item funded housing projects over $250,000 will be managed by the Denver Service Center unless granted a waiver by the Associate Director, Planning and Development. All other housing projects over $250,000 will require the approval of the Associate Director, Planning and Development.

E. REHABILITATION/REPAIR - All rehabilitation/repair projects must comply with the NPS-76 guidelines. The following is provided as a guide:

1. Existing Fund Sources - To be used for all projects that are $20,000 or less for one and two family housing, and $10,000 or less for multiple family or dorm units.

2. Housing Initiative Funds - To be used for housing projects that will cost in excess of $20,000 for one and two family housing or $10,000 for multiple family housing or dorm units.

3. Life Cycle Cost Analysis (rehabilitation vs. new) - When cost to rehabilitate a one or two family housing unit will exceed $40,000 or $20,000 for multiple family housing or dorm unit, an analysis must be completed to assure that it is cost-effective to repair the unit rather than constructing a new one. Although economic factors are important, we must also be cognizant of the cultural, natural, and visual resources in the overall evaluation.

The preceding dollar guidelines are just that. The intent is to assure that the dollar levels now being expended from existing regional and park programs continue at the present percentage of expenditures from cyclic, repair/rehab, cultural cyclic, park operating funds, and housing income, and that the upgrading of housing does not become totally dependent on special initiatives and the dollars associated with them.

I want to once again stress the importance of quality housing. Housing is an important management tool, and the National Park System cannot function without employee housing. Quality housing is needed if we are to accomplish the goals and objectives as defined in the August 25, 1916, Act establishing the Service.

This Directive will remain in effect until further notice as a statement of goals and objectives for Park Service housing and will remain a part of NPS-76.

For each park there are useful reference materials that set the course for planning and design and program action decisions and that establish systematic and effective comprehensive knowledge with respect to the broad and specific designs related to the park unit.

The following documents are produced during the course of planning for a national park system unit:

Statement for Management (SFM) - Assesses conditions, identifies planning issues and problems, and determines management objectives.

Outline of Planning Requirements (OPR) - Lists, in priority order, needed studies, surveys, plans, and designs.

Development/Study Package Proposal (10-238) - Provides details/ justification and requests programming/funding to accomplish OPR tasks.

Task Directive - Sets forth an agreement between involved parties as to the scope of work, the issues to be addressed, and the methodology, products, costs, schedule, and responsibilities for accomplishing a planning task that has been funded.

General Management Plan/Environmental Document (GMP) - Identifies management philosophy for the unit and provides strategies for resolving issues and achieving management objectives over a five- to 10-year period.

Implementing Plans - Development concept plans, land protection plans, resource management plans, wilderness plans, interpretive prospectuses, concessions management plans, special studies, and design character studies--each of these documents represents an opportunity for participation by different levels of NPS management.

GOVERNMENT FURNISHED HOUSING GUIDELINES

The "Government Furnished Housing Management Guidelines" (NPS-36) prescribe NPS procedures governing the management, maintenance, and rental of government furnished housing.

In performing surveys and making recommendations it is important that the Housing Unit Design Assistance Team (HUDAT) members have a general understanding of the guidelines managers at various levels are required to operate within. This knowledge of the overall housing management program will prepare the teams to make better recommendations to management based not only on the physical aspects but also management restrictions.

The following chapters from NPS-36 should be areas of particular concern to the HUDAT.

Chapter 1. Responsible Officials and Offices

This chapter details what position and offices are responsible for housing actions, i.e., the director will approve all new construction, acquisition, and additional or replacement housing.

Chapter 2. Housing Management

This chapter includes guidelines for formulating the housing management plans. It also includes details from the "Housing Maintenance Management Report" concerning income, projected projects, funds from other sources, and actual work accomplishments.

Chapter 3. Construction Acquisition and Retention

Shows limitations on new construction, replacement criteria, and justification process for retaining existing housing.

Chapter 4. Housing Inventory

Includes samples of administrative inventories and details how they are to be assembled.

Chapter 5. Rental Rates

Details formulation of rental rates including isolation adjustments. This information will be helpful in understanding projected income for continued maintenance and life-cycle costs.

Chapter 7. Charges for Related Services

This chapter explains how certain aspects of operations and maintenance are to be supported, i.e., charges for storage areas and charges for NPS-performed landscape maintenance.

The following pages from NPS-36 are included to outline the objectives and demonstrate the range of subject matter covered in the "Government Furnished Housing Management Guidelines" (NPS-36).

GOVERNMENT FURNISHED HOUSING MANAGEMENT
NPS-36

GUIDELINE
PAGE x

OBJECTIVES

This Guideline has been developed to provide for the management of NPS Government Furnished Housing.

The objectives of the NPS Housing Management Program are to:

1. Provide for the establishment, maintenance, and retention of housing consistent with regulations and policy.

2. Effectively and economically utilize the NPS-owned structures for the maximum benefit of the Services's obligations and responsibilities to the public.

3. Establish appropriate authorities and responsibilities for the management and administration of the housing program.

4. Establish procedures and operational instructions for program management and administration, and for housing maintenance and operation within the National Park Service.

5. Promulgate Departmental instructions necessary to establish defined uniform methods to appraise and set housing rental rates and GFH occupancy criteria.

6. Establish inspection and maintenance requirements and procedures that ensure occupants safe and healthful Government-owned housing that meet appropriate standards.

7. Establish procedures to determine condition of housing, and to require that substandard units not be used as housing until brought up to standard.

8. Eliminate substandard housing.

TABLE OF CONTENTS

CHAPTER — PAGE

TITLE PAGE.....
Table of Contents..... i
Exhibits..... v
Authorizing Signature..... vi
Introduction and Acknowledgements..... vii
Principles, Purpose, and Authority..... viii
Objectives..... x

1. RESPONSIBLE OFFICIALS AND/OR OFFICES
Director, National Park Service..... 1
Housing Management Office, Washington Office..... 1
Manager, Denver Service Center 2
Regional Director..... 2
Regional Housing Office..... 3
Regional Division of Engineering and Maintenance.. 4
Park Manager..... 4

2. HOUSING MANAGEMENT
Housing Management Plan..... 1
Housing Maintenance Management..... 6
Reporting Requirements..... 4
Housing Maintenance Management Report (Exhibit 1). 8
Housing Maintenance Management Report Sample (Exhibit 1A)..... 9

3. CONSTRUCTION, ACQUISITION AND RETENTION
New Housing (Acquired or Constructed)..... 1
Cost Limitations 2
Replacement Housing..... 5
Temporary Structures..... 6
Contracting for Private Rental Housing..... 6
Disposal of Housing Structures..... 7
Justification for New or Replacement Housing (Exhibit 2)..... 8
Report of Survey (Exhibit 16)..... 9
Report of Excess Real Property (Exhibit 17)..... 11

4. HOUSING INVENTORY INSTRUCTIONS
Housing Inventory..... 1
Instructions (Exhibit 3)..... 2
Inventory Form (Exhibit 4)..... 25
State Numeric Codes (Exhibit 4A)..... 26
Building Size and Number of Stories (Exhibit 5)... 28

CONTENTS (Continued)

5. ESTABLISHMENT OF MONTHLY BASE RENTAL RATES

Base Rental Principles..... 1
Survey and Appraisal Policies 1
Procedures to Estimate Base Rental Rate..... 2
Recordation of Amenities..... 2
Informing Occupants..... 2
INspection of Housing..... 3
Appraisal (Services & Methods)..... 3
Comparable Lease Data Form..... 3
Rental Rate Comparability Form..... 4
Inventory Form..... 4
Required Comparable Leases..... 4
Regional Survey..... 6
Individual Appraisals in Urban and Suburban Locations..... 7
Special Waiver..... 7
Individual Appraisals in Rural Areas..... 7
Unusual Appraisal Problems..... 8
Bunkhouse/Dormitory/Multi Family Rates..... 9
Transient Housing..... 10
Temporary Housing..... 10
Comparable Lease Data Form (Exhibit 6)..... 12
Rental Rate Comparability Form (Exhibit 7)..... 14

6. ADMINISTRATIVE ADJUSTMENTS

Isolation Adjustment..... 1
Isolation Adjustment Form (Exhibit 8)..... 3
Site Amenities..... 5
Documentation..... 7
Imposition on Privacy (or Living Space)..... 7
Inadequate Size..... 10
Excessive Size 11
Excessive Heating/Cooling 12
Adjustment Limitation..... 14
Incremental Implementation 14
Notification Requirements to Tenant 14
Monthly Rental and Adjustment Calculation (Exhibit 9)..... 15
Notice of Rental Adjustment (Exhibit 9)..... 16
Excessive Heating/Cooling Adjustment Form (Exhibit 10)..... 17

CONTENTS (Continued)

7. CHARGES FOR RELATED FACILITIES/SERVICES
- Determination of Charge(s) 1
- Special Services..... 1
- Utilities and Related Services..... 2
- Furnishings and Appliances..... 4
- Property Management 5
- Schedule of Charges (Exhibit 11)..... 6

8. CONSUMER PRICE INDEX ADJUSTMENT 1

9. ASSIGNING AND VACATING OF QUARTERS
- Housing Assignment Agreement 2
- Housing Furnished Volunteers In the Parks (VIPs)..... 2
- Inspection Procedures When Occupant Move Into GFH. 2
- Vacating Housing. 3
- Eviction Authority 3
- Relocation of Employee's Dependents..... 3
- Nontemporary Storage of Personal Household Goods.. 3
- Inspection Procedures When Housing Is Vacated 3
- Insurance..... 4
- Possessory Interest Tax 4
- Housing Assignment Agreement (Exhibit 12)..... 6
- Housing Deduction Input Form (Exhibit 13)..... 8
- Housing Occupancy/Vacancy Inspection Form (Exhibit 14)..... 9

10. REQUIRED OCCUPANCY
- Required Occupancy Plan 1
- Recommendation and Use of Required Occupants 5
- Release from Required Occupancy 6
- Certification of Required Occupancy (Exhibit 16).. 7

11. REQUESTS FOR RECONSIDERATION AND APPEALS
- Request for Reconsideration..... 1
- Appeals..... 3

12. RENTAL OF GOVERNMENT HOUSING TO PUBLIC AND OTHER GOVERNMENT AGENCIES
- Private Sector..... 1
- Interior Employees (Other Than NPS) 1
- Other Government Employees 1
- Essential Cooperators..... 1

CONTENTS (Continued)

13. TENANT/EMPLOYEE INVOLVEMENT IN THE HOUSING MANAGEMENT PROGRAM
Role of the Tenant/Employee 1
Tenant/Employee Involvement 1
Housing Inventory..... 1
Housing Maintenance Inspection 1
Imposition on Privacy or Living Space 2
Park Assignment Procedures 2
Contact with NPS Management..... 2
Tenant/Employee Committees..... 2

14. DEFINITIONS 1-9

15. EXHIBITS
Housing Maintenance Management Report (Form 10-372)..... 1
Sample - Housing Maintenance Management Report.... 2
Justification for New or Replacement Housing..... 3
Inventory Instructions (See Chapter 4)..... --
Inventory Form (Form 10-374)..... 4
State Numeric Codes (See Chapter 4, pages 25 and 26)..... --
Explanation of Building Sizes (See Chapter 4)..... 5
Comparable Lease Data Form (Form 10-375)..... 7
Rental Rate Comparability Form (Form 10-376)..... 9
Base Rental Report (Form 10-376A and B)..... 10
Isolation Adjustment Form (Form 10-377)..... 12
Monthly Rental and Adjustment Calculation Form (Form (Form 10-378A)..... 14
Notice of Rental Adjustment (Form 10-378B)..... 15
Excessive Heating/Cooling Deduction (Form 10-379). 16
Schedule of Charges (See Chapter 7, pages 6-7).... --
Housing Assignment Agreement (Form 10-380)..... 18
Housing Deduction Input Form (Form 10-381)..... 20
Housing Occupancy/Vacancy Inspection Form (Form 10-382)..... 21
Certification of Required Occupancy (Form 10-383)..... 23
Report of Survey (Form DI-103)..... 24
Report of Excess Real Property (Form SF-118)..... 26

16. RECORD KEEPING REQUIREMENTS 1-3

17. FILING 1

INDEX

EXHIBITS

	FORM No.	CHAPTER/ PAGE No.
EXHIBIT 1 - Housing Maintenance Management Report	10-372	2-8
EXHIBIT 1A Housing Maintenance Management Report.. SAMPLE		2-9
EXHIBIT 2 - Justification for New or Replacement Housing	10-373	3-8
EXHIBIT 3 - Inventory Instructions		4-2
EXHIBIT 4 - Inventory Form	10-374	4-24
EXHIBIT 4A State Numeric Codes		4-25
EXHIBIT 5 - Explanation of Building Size		4-27
EXHIBIT 6 - Comparable Lease Data Form	10-375	5-12
EXHIBIT 7 - Rental Rate Comparability Form	10-376	5-14
Base Rental Report	10-376 A and B	5-15
EXHIBIT 8 - Isolation Adjustment Form	10-377	6-3
EXHIBIT 9 - Monthly Rental and Adjustment Calculation 10-378A		6-15
Notice of Rental Adjustment	10-378B	6-16
EXHIBIT 10 - Excessive Heating/Cooling Deduction	10-379	6-17
EXHIBIT 11 - Schedule of Charges		7-6
EXHIBIT 12 - Housing Assignment Agreement	10-380	9-6
EXHIBIT 13 - Housing Deduction Input Form	10-381	9-8
EXHIBIT 14 - Housing Occupancy/Vacancy Inspection Form	10-382	9-14
EXHIBIT 15 - Certification of Required Occupancy	10-383	10-7
EXHIBIT 16 - Report of Survey	DI-103	3-9
EXHIBIT 17 - Report of Excess Real Property	SF-118	3-11

CHECKLIST

RANGE OF HOUSING TYPES

Provide a range of housing types based on
- national trends in family sizes
- park statistical data on marital status/family size

For family housing provide
- some 2-bedroom units
- mostly 3-bedrooms units
- some 4-bedroom units

TYPE OF HOUSING

Similar to acceptable housing normally built in area (but must complement park environment)

Consider multifamily dwellings for possible economies in construction and maintenance

Single-family housing can be justified if location is remote from community facilities

PROSPECTIVE RENT LEVELS

Ensure rental rate of housing types constructed is within reach of employees to be housed

NUMBER OF ROOMS

Proportion number of rooms, bedrooms, and baths with normal size and composition of families to be housed

SIZE OF HOUSING UNIT (normal net floor areas)

2-bedroom	1,000 sq ft
3-bedroom	1,415 sq ft
4-bedroom	1,670 sq ft

Add 10% for
- areas outside continental U.S.
- areas that are extremely isolated
- areas where weather confines family for long periods of time

SPECIAL FEATURES

May be able to justify additional storage space, recreational rooms, and features normally found in local rental housing.

DESIGN STANDARDS

OMB design standards have given way to national model codes.

Use Council of American Building Officials' "One and Two Family Dwelling Code" for safeguarding life and limb and HUD unit design criteria for minimum livability standards.

[copy]

EXECUTIVE OFFICE OF THE PRESIDENT
Bureau of the Budget
Washington, D.C.

October 18, 1957

CIRCULAR NO. A-18
Revised

TO THE HEADS OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS

SUBJECT: Policies on construction of family housing

Determination of number of families to be housed and pattern of housing required. The agency should determine the number of families to be housed under the particular circumstances and the probable pattern of family size and composition by a statistical study of families and numbers of dependents within the service or agency adjusted for agency experience, changes in staffing patterns, and national trends in family size. Most frequently, the agency will be adding a limited number of houses at a station where some housing already exists. Under these circumstances, the agency should first make certain that existing housing is properly assigned. After ascertaining that there is a proper utilization of existing housing, the agency should determine what further construction, if any, is required to establish a proper pattern of housing at the station. The determination must discount temporary and unusual peak numbers of employees at the station, but not necessarily recurring requirements for seasonal employees who must be housed. Three general situations with basically different housing requirements are likely to occur.

a. Small station: Where only 1 to 5 Government houses are to be supplied at a station, it is likely that no stable family pattern can be predicted on a statistical basis. The most reasonable method of meeting the housing requirement under these circumstances is to supply three 3-bedroom houses, one 2-bedroom house, and one 4-bedroom house.

b. Medium-size station: Where 5 to 25 Government houses are to be supplied, the group is probably still too small to expect a stable family pattern, but the group is too large to permit building all houses the same size. Under these circumstances, the agency should seek to develop a flexible housing supply, if possible. However, in view of family size trends, it would be best to construct mostly 3-bedroom houses, with a smaller number of 2-bedroom houses, and a few 4-bedroom houses.

c. Large station: Where more than 25 Government houses are to be supplied, it is reasonable to expect that a fairly stable

[copy]

family pattern exists. Under these circumstances, the agency should determine what this pattern is, as described above, and, utilizing the table given below, should plan to provide the appropriate number and distribution of rooms. At military installations the probable number of personnel entitled to family housing quarters by grade, rank, and position will determine the family housing requirements. In the table of net floor areas given below, the normal construction limits will govern the maximum areas of houses being constructed, except that agencies may construct up to the statutory or maximum limitation for housing for commanding officers and in unusual circumstances. The numbers of rooms will be governed by the table below showing relation between number of bedrooms and net square footage areas. The Bureau of the Budget will consider exceptions under special circumstances only when fully justified.

Types of family dwellings to be constructed. Family dwellings similar in type to acceptable dwellings normally built in the local area will be constructed whenever practicable, with full advantage being taken of the economy of construction and maintenance of multiple-family dwellings--apartment, row, or duplex. The construction of single family dwellings may receive special consideration in locations where remoteness of the station from other community facilities makes it undesirable from the standpoint of safety; employee morale, recruitment and retention of personnel, and satisfactory living conditions under adverse circumstances to house employees in multiple-family dwellings.

Prospective rental levels and their effect on construction. The type of dwellings to be constructed will also be governed by the amount of rent that the occupants can afford to pay (public quarters excepted). Rents are required to be based on prevailing rates in the local market for comparable accommodations (see Bureau of the Budget Circular No. A-45). Hence, care must be taken to be sure that dwellings would rent at rates within the reach of employees to be housed. In cases where there are large numbers of high-salaried personnel who would normally rent larger houses than are usually provided on the station and where the ability to hold such employees in Government service may be dependent upon the housing available, agencies may construct a limited number of larger houses upon securing specific advance approval from the Bureau of the Budget.

Determination of the number of rooms to be provided in family housing. The number of rooms to be provided must be based on the size and normal composition of families to be housed. Consideration should be given to the trend toward larger families, but agencies should not build all units to accommodate large families. It is permissible to provide larger houses for civilian directors or military commanders of large stations, for military officers of general or flag rank, chiefs of Foreign Service missions, Foreign Service officers with the rank of career minister, and

[copy]

to a limited extent for higher salaried personnel who can afford to and will pay commercially comparable rents for superior quarters. The table below indicates the number of rooms and bedrooms which should normally be planned for families of varying sizes. Again, the Bureau of the Budget will consider justified exceptions depending upon the remoteness of the small or medium-size station and the extent to which the family is isolated from normal community facilities.

No. of persons in household	No. of rooms to be provided*	No. of bedrooms	No. of baths
2-3	4	2	1
4	5, 5½, or 6	3	1 or 1½
5	5½, 6, or 7	3 or 4	1½ or 2
6	7	4	2

*A room is a living space of not less than the minimum size set forth in "Design Standards for Construction of Permanent Family Housing," such as a living room, bedroom, kitchen, finished attic or basement, or other suitable living space. A half room is a small space used for living purposes, such as a dinette, breakfast-nook, dressing room, or reception room. No count is made of bathrooms, strip or pullman kitchens, halls or foyers, alcoves, pantries, laundries, storage or utility rooms, or unfinished attics and basements.

Net areas of houses. Net area is defined as space inside exterior or party walls, excluding only attic, garage, and basement (or service and storage space in lieu of basement). The net areas shown below may be increased 10 percent (1) if outside the continental United States, (b) for commanding officers or civilian heads of large installations, or (c) under conditions of extreme isolation where the family may be confined to the home for long periods due to weather conditions or lack of community facilities within reasonable distance. The minimum floor areas below represent the limit below which it is not deemed advisable to go when building permanent housing; such minimum areas should be used only for multiple-family dwellings. Maximum floor areas represent the limit above which Federal funds need not be invested to provide housing reasonably commensurate with income for all but the highest income groups.

Although agencies cannot always determine the grades of the occupants, there is a normal range of grades for the personnel who are required or permitted to occupy Government housing on the station. The minimum size for the number of bedrooms needed should be provided for those in the lowest grades in order that the housing may not be more expensive than the occupants could be expected to rent if they were

[copy]

securing their own quarters commercially. Larger quarters may be provided for progressively higher grades up to the maximums for personnel at and above general schedule grade 14 and ranks equivalent to the military rank of colonel.

MAXIMUM AND MINIMUM NET FLOOR AREAS PER DWELLING UNIT 1/
(square foot)

	1 Bedroom 2/	2 Bedrooms	3 Bedrooms	4 or more Bedrooms
Minimum 3/	550	750 5/	960 5/	1,190 5/
Normal 4/	730	1,000	1,415	1,670
Maximum	810	1,250 6/	1,670 6/	2,100 6/,7/

1/ Net area is space inside exterior or party walls, excluding only attic, garage, and basement (or service and storage space in lieu of basement).

2/ For multi-family or apartment construction only. No one bedroom houses should be built.

3/ Any construction proposed to provide less square footage than these minimums must be specifically approved by the Bureau of the Budget.

4/ Budget estimates will not be considered for construction beyond these normal limits unless accompanied by a specific determination of the agency head that up to the specified maximums are necessary.

5/ Applies to flats or multi-family construction. Not recommended for single or duplex houses.

6/ Applies to single family houses without basements for higher salaried personnel only.

7/ Larger areas may be considered by the Bureau of the Budget on special justification for heads of large stations, flag officers, or in unusual circumstances only.

Special features. Special features may be provided to meet special work or isolation conditions. This includes: extra rooms with outside doors for the employee whose home is also his work headquarters; special

[copy]

access to bath or shower rooms without going through the house where the employee's work is particularly dirty and shower facilities are not provided in work buildings; fireplaces in remote areas where wood is readily available and the fireplaces would serve a practical purpose; extra storage space and facilities where distances to market are such as to necessitate purchasing food and other supplies in quantity; some space for recreation purposes where families may be confined to the house for long periods of time during bad weather conditions. Provision may be made for other special features, such as air conditioning, only where they are customarily provided in rental housing in the area.

Design standards. At the request of the Bureau of the Budget, the Housing and Home Finance Agency, with suggestions from the affected agencies, has revised the booklet, "Design Standards for Construction of Permanent Family Housing for Federal Personnel."* The standards have been brought up to date with technological developments in the housing field. The purpose of the booklet is to assist and guide agencies in planning construction of permanent family housing so as to provide standards of livability, durability, safety, and sanitation which will be adequate without imposing an unreasonable and uneconomical burden upon the Government.

Compliance with design standards. Agencies shall plan new construction of family housing in accordance with the standards and policies of the booklet and this Circular. Budget requests and apportionment requests for this purpose shall be based upon compliance with the approved design standards and the provisions of this Circular. The square-foot construction cost should not exceed that generally recognized as prevailing in the area for non-Federal dwellings of similar size and type of occupancy. Exceptions may be made by those agencies constructing housing outside the continental United States where climatic conditions or local building codes and restrictions prevent compliance. Any other exceptions should be plainly set forth in the budget or apportionment request.

[end copy]

---

*This booklet is out of print and out of date; it has been replaced by HUD's "Minimum Property Standards, One and Two Family Dwelling Code" booklet and local application of national codes. Both booklets will be replaced by the Council of American Building Officials' "One and Two Family Dwelling Code."

CHECKLIST

The following list identifies the national building codes recommended for establishing the minimum design, material, equipment, construction and use standards to safeguard life and limb in NPS housing construction and rehabilitation.

DETACHED ONE- AND TWO-FAMILY DWELLINGS NOT MORE THAN THREE STORIES IN HEIGHT

"CABO One and Two Family Dwelling Code," 1986 edition as amended
Council of American Building Officials
5203 Leesburg Pike, Suite 708
Falls Church, Virginia 22041

A summary of the general building planning considerations found in the CABO code and a copy of the table of contents are provided on the following pages.

APARTMENTS, DORMITORIES, AND LODGES

"Uniform Building Code" 1985 edition
International Conference of Building Officials
5360 South Workman Mill Road
Whittier, California 90601

Included in the following pages is a reproduction of the UBC requirements for residential occupancies exceeding 10 persons or two families. Consult the actual code book for associated references for design, materials, and construction, as well as for exceptions.

HISTORIC BUILDINGS

"Uniform Code for Building Conservation"
International Conference of Building Officials
5360 South Workman Mill Road
Whittier, California 90601

A copy of the outline of contents and the minimum standards for existing buildings, changes of occupancy, historic structures, and residential occupancies is included later in this chapter.

FIRE PROTECTION/LIFE SAFETY

NFPA 101 - Life Safety Code, 1985
National Fire Protection Association
Batterymarch Park, Quincy, Mass. 02269

NPS 50 - "Loss Control Management Program"

See later page in this chapter for specific information regarding these standards.

REHABILITATION

In addition to the preceding codes, the following publications from the Department of Housing and Urban Development (HUD) are excellent guides for rehabilitation.

5, "Egress Guideline for Residential Rehabilitation," 1980.
6, "Electrical Guideline for Residential Rehabilitation," 1980.
7, "Plumbing DWV Guideline for Residential Rehabilitation," 1980.
8, "Guideline for Fire Ratings of Archaic Materials," 1980.
9, "Guideline for Structural Assessment," 1982.
#10, "Guideline on the Rehabilitation of Walls, Windows, and Roofs," 1982.
#11, "Guideline for Residential Building Systems Inspection," 1984.

They are available for $3.00 each from the HUD USER, P.O. Box 280, Germantown, Maryland 20874, 301-251-5154.

CABO

One and Two Family Dwelling Code

1986 Edition

Under the
Nationally Recognized Model Codes

BASIC NATIONAL BUILDING CODE
BUILDING OFFICIALS AND CODE ADMINISTRATORS
INTERNATIONAL, INC.
4051 West Flossmoor Road, Country Club Hills, Illinois 60477

STANDARD BUILDING CODE
SOUTHERN BUILDING CODE CONGRESS
INTERNATIONAL, INC.
900 Montclair Road, Birmingham, Alabama 35213

UNIFORM BUILDING CODE
INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
5360 South Workman Mill Road, Whittier, California 90601

The following pages include a summary of the "Building Planning" chapter found in the CABO code and a copy of the table of contents. Consult the actual code book for specific requirements for design, materials, and construction, as well as for exceptions.

Design Criteria

Climatic criteria -

- snow load
- wind pressure
- frostline depth
- weathering damage
- termite damage
- decay damage

Live load -

dwelling (except sleeping rooms)	40 psf
sleeping rooms	30 psf
attics (limited storage)	20 psf
attics (no storage)	10 psf
garages	50 psf
balconies/decks	60 psf

Dead load - actual weights of materials, construction, and fixed service equipment

Partition load - 5 psf minimum lateral load resistance for interior walls

Maximum deflection -
- 1/240 of span for structural members
- 1/360 of span for floor construction and plastered ceiling
- 1/180 of span for high slope rafter construction
- 1/180 of vertical span for interior walls

Light and Ventilation

Minimum glazing for each habitable room = 8% floor area (minimum half of glazing to be operable). Note: NPS preferred minimum glazing is 10% of floor area.

Exception: when mechanical ventilation provides minimum of two air changes/hour and artificial lighting can produce six footcandles at 30" above floor.

Bathrooms: minimum 3 sq ft of glazing (half operable)

Exception: when artificial lighting is provided and mechanical ventilation can provide a minimum of 5 air changes/hour

Room Sizes

Dwelling must contain minimum of one room of not less than 150 sq ft (living room)

Other habitable rooms must not be less than 70 sq ft or 7 ft wide

Kitchens must be a minimum of 50 sq ft

Ceiling Height

7'-6" minimum for at least 50 percent of required room size

7'-0" minimum clear height allowed in kitchens and baths

Safety Glazing in Hazardous Locations

Ingress doors except wired glass in firedoors and jalousies

Fixed and sliding panels of patio doors

Storm doors

Unframed swinging doors

Shower/bathtub doors and enclosures

Glazing adjacent to a door (in same plane, within 12" of the door closed, and bottom edge less than 60" above floor)

Attached Garages

Opening to residence to be equipped with solid wood door, minimum 1-3/8" thickness (cannot open directly into sleeping room)

Garage and residence separated by ½" gypsum board on garage side
Note: NPS preferred minimum separation is 5/8" gypsum board

Garage/carport floor to be noncombustible and sloped to drain

Required Exits

Exit door to be minimum 3'-0" wide x 6'-8" high, side-hinged

Sleeping rooms must have exterior door or operable window with maximum sill height of 44", minimum net opening of 5.7 sq ft, 24" minimum net height, and 20" minimum net width

Minimum 3-foot x 3-foot landing on each side of egress door (if floor level varies)

Stairways

Closed-riser stairs require 1" nosing on treads

Minimum 3'-0" stairway width (less up to 3½" each side for handrails)

Handrails

Required on at least one side of stairway of three or more risers

30" minimum, 34" maximum vertical height from stair tread nosing

Continuous the full length of stairs and extends 6" beyond top and bottom risers with returned or newel post ends

Railing maximum width of 2-5/8" and minimum 1½" space from wall

Guardrails

36" minimum height for porches, balconies, raised floor areas, or open sides of stairways located more than 30" above floor or grade

Railing closure must prohibit passage of 6" diameter object

Smoke Detectors

Required outside each separate sleeping area and on each additional story of the dwelling

In new construction, connect to primary power source

In existing buildings may be battery powered

Foam Plastic Used in Building Construction

Maximum flame-spread rating of 75

Maximum smoke-density rating of 450

Must be separated from interior of building by an approved thermal barrier (see CABO R-217 (0.1 tc 2.4))

Wall and Ceiling Finishes

Maximum flame-spread rating of 200

Maximum smoke density rating of 450

Two-Family Dwelling Unit Separation

Minimum 1-hour fire resistive rating

The following pages are reproduced from the CABO One and Two Family Dwelling Code, 1986 edition, copyright 1986, with permission of the Council of American Building Officials.

CONTENTS

Part I—ADMINISTRATIVE

CHAPTER 1—Administrative

Section		Page
R-101	Title	1
R-102	Purpose	1
R-103	Scope	1
R-104	Authority	1
R-105	Entry	1
R-106	Violations and Penalties	1
R-107	Right of Appeal	2
R-108	Alternate Materials and Systems	2
R-109	Permit	2
R-110	Plans	2
R-111	Inspection	3
R-112	Prefabricated Construction	3
R-113	Inspection Card	3
R-114	Existing Installations	4
R-115	Definitions	4

PART II—BUILDING PLANNING

CHAPTER 2—Building Planning

Section		
R-201	General	7
R-202	Design Criteria	7
R-203	Location on Lot	7
R-204	Light and Ventilation	8
R-205	Room Sizes	9
R-206	Ceiling Height	9
R-207	Sanitation	9
R-208	Toilet, Bath and Shower Spaces	9
R-209	Glazing	10
R-210	Attached Garages	11
R-211	Exits	11
R-212	Doors and Hallways	11
R-213	Landings	11
R-214	Stairways	12
R-215	Handrails and Guardrails	12
R-216	Smoke Detectors	12
R-217	Foam Plastic	13
R-218	Flame Spread	14
R-219	Dwelling Unit Separation	14
R-220	Ramps	14

PART III—CONSTRUCTION

CHAPTER 3—Foundations

Section

R-301 General 19
R-302 Materials 19
R-303 Footings 19
R-304 Foundation Walls 19
R-305 Foundation Drainage 21
R-306 Foundation Dampproofing 21
R-307 Columns 22
R-308 Protection Against Decay and Termites 22
R-309 Crawl Space 23

CHAPTER 4—Wall Construction

Section

R-401 General 33
R-402 Dimension Lumber 33
R-403 Metal 35
R-404 General Masonry Construction 35
R-405 Hollow-unit Masonry 38
R-406 Solid Masonry 38
R-407 Cavity Wall Masonry 39
R-408 Grouted Masonry 39
R-409 Reinforced Grouted Masonry 41
R-410 Reinforced Hollow-unit Masonry 41
R-411 Windows 42
R-412 Sliding Glass Doors 42

CHAPTER 5—Wall Covering

Section

R-501 General 63
R-502 Interior Covering 63
R-503 Exterior Covering 64

CHAPTER 6—Floors

Section

R 601 General 75
R-602 Dimension Lumber 75
R-603 Concrete Floors (On Ground) 76
R-604 Treated-wood Floors (On Ground) 77
R-605 Metal 78
R-606 Plywood 78
R-607 Particleboard 78

CHAPTER 7—Roof-Ceiling Construction

Section

R-701 General 85
R-702 Dimension Lumber 85

R-703 Plywood ... 86
R-704 Particleboard ... 86
R-705 Metal ... 87
R-706 Ceiling Finishes ... 87
R-707 Attic Ventilation ... 87
R-708 Attic Access ... 87

CHAPTER 8—Roof Coverings

Section

R-801 General ... 91
R-802 Deck Preparation ... 91
R-803 Asphalt Shingles ... 91
R-804 Slate Shingles ... 92
R-805 Asbestos-cement Shingles ... 92
R-806 Metal ... 93
R-807 Tile, Clay or Concrete Shingles ... 93
R-808 Built-up Roofing ... 93
R-809 Wood Shingles ... 94
R-810 Wood Shakes ... 94

CHAPTER 9—Chimneys and Fireplaces

Section

R-901 General ... 97
R-902 Masonry Chimneys ... 97
R-903 Factory-built Chimneys ... 98
R-904 Masonry Fireplaces ... 98
R-905 Factory-built Fireplaces ... 99
R-906 Factory-built Fireplace Stoves ... 100

PART IV—MECHANICAL

CHAPTER 10—Mechanical—Materials and Definitions

Section

M-1001 Application ... 105
M-1002 Definitions ... 105

CHAPTER 11—Equipment, General

Section

M-1101 General ... 111
M-1102 Appliance Clearance ... 111
M-1103 Type of Fuel ... 111
M-1104 Shutoff Valve ... 111
M-1105 Appliance Installation ... 111
M-1106 Appliance Access ... 111
M-1107 Control Devices ... 111
M-1108 Ranges—Vertical Clearance Above Cooking Top ... 112
M-1109 Ranges—Horizontal Clearance to Built-in Top Cooking Units ... 112
M-1110 Open-top Broiler Units ... 112

One and Two Family Dwelling Code

M-1111 Clothes Dryers (Moisture Exhaust) ... 112
M-1112 Fuel-burning Appliance Labeling ... 113
M-1113 Electrical Appliance Labeling ... 113
M-1114 Appliance ... 113
M-1115 Connection Requirement Appliances ... 114

CHAPTER 12—Combustion Air

Section

M-1201 General Air Supply ... 119
M-1202 Volume Required ... 119
M-1203 Air Supply ... 119
M-1204 Combustion Air Source ... 119
M-1205 Attic Combustion Air ... 119
M-1206 Under-floor Combustion Air ... 120
M-1207 Opening Requirements ... 120
M-1208 Combustion Air ... 120
M-1209 Gravity-type Warm-air Furnaces ... 120
M-1210 Exhaust and Ventilation Systems ... 120
M-1211 Cold Climate ... 120

CHAPTER 13—Warm-air Furnace

Section

M-1301 Installation ... 123
M-1302 Combustion Air ... 123
M-1303 Access ... 123
M-1304 Prohibited Location ... 123
M-1305 Clearance for Warm-air Furnaces ... 124
M-1306 Attic Furnaces ... 124
M-1307 Under-floor Furnaces ... 124
M-1308 Exterior Furnaces ... 125
M-1309 Circulating Air Supply ... 125
M-1310 Circulating Air Supply—Area Requirements ... 125
M-1311 Circulating Air Supply—Prohibited Source ... 126
M-1312 Conditioned Air Supply—Area Requirements ... 126

CHAPTER 14—Vented Decorative Appliances, Floor Furnaces, Vented Wall Furnaces and Vented Room Heaters

Section

M-1401 General ... 127
M-1402 Vented Decorative Appliances ... 127
M-1403 Floor Furnace Location ... 127
M-1404 Floor Furnace Access ... 127
M-1405 Floor Furnace Installation ... 128
M-1406 Wall Furnace Location ... 128
M-1407 Wall Furnace Combustion Air ... 128
M-1408 Wall Furnace Installation ... 128
M-1409 Room Heaters ... 128
M-1410 Unvented Room Heaters ... 128

CHAPTER 15—Venting of Appliances

Section

M-1501 General . . . 129
M-1502 Type of Venting Systems Required . . . 129
M-1503 Installation and Construction . . . 129
M-1504 Location and Support of Venting Systems Other than Chimneys . . . 129
M-1505 Vent Offsets . . . 130
M-1506 Vent Termination—General . . . 130
M-1507 Gravity Vent Termination . . . 130
M-1508 Wall Vent Termination . . . 130
M-1509 Type B or BW Vent Termination . . . 130
M-1510 Type L Vent Termination . . . 130
M-1511 Location of Vent Terminal . . . 130
M-1512 Vent Size . . . 131
M-1513 Multiple-appliance Venting Systems . . . 131
M-1514 Existing Venting Systems . . . 131
M-1515 Draft Hoods . . . 131
M-1516 Connectors . . . 132
M-1517 Plastic Venting Systems . . . 135

CHAPTER 16—Ducts

Section

M-1601 Materials . . . 137
M-1602 Installation . . . 137
M-1603 Insulation . . . 137
M-1604 Under-floor Plenum for a Single-dwelling Unit . . . 138

CHAPTER 17—Comfort Cooling

Section

M-1701 Installation . . . 141
M-1702 Access . . . 141
M-1703 Circulating Air Supply Source . . . 141
M-1704 Circulating Air Limitation . . . 141
M-1705 Screen . . . 141
M-1706 Refrigerant Piping Insulation . . . 141
M-1707 Evaporative Cooling Systems . . . 142

CHAPTER 18—Absorption Units and Absorption Systems for Comfort Cooling and Comfort Heating

Section

M-1801 General . . . 143
M-1802 Identification . . . 143

CHAPTER 19—Fuel-supply Systems

Section

M-1901 General . . . 145
M-1902 Location . . . 145
M-1903 Meter Valve . . . 145
M-1904 Authority to Disconnect . . . 145

M-1905 Materials ... 145
M-1906 Protection ... 146
M-1907 Piping Support ... 146
M-1908 Connections ... 146
M-1909 Valves ... 146
M-1910 Appliance Connectors ... 147
M-1911 Required Gas Supply ... 147
M-1912 Size, General ... 147
M-1913 System Piping Size ... 147
M-1914 Oil Fuel Supply ... 148
M-1915 Fuel-oil Piping and Connections ... 148
M-1916 Prohibited Fittings ... 148
M-1917 Oil-supply Pumps and Valves ... 148
M-1918 Oil Burners ... 149
M-1919 Controls ... 149
M-1920 Inspection and Test ... 149

PART V—PLUMBING

CHAPTER 20—General Plumbing Requirements and Definitions

Section

P-2001 General ... 153
P-2002 Individual Water Supply and Sewage Disposal ... 153
P-2003 Structural and Piping Protection ... 153
P-2004 Excavations and Backfill ... 154
P-2005 Water and Sewer Pipes ... 154
P-2006 Support ... 155
P-2007 Joints and Connections ... 155
P-2008 Mortar ... 155
P-2009 Adaptors ... 155
P-2010 Slip Joints ... 155
P-2011 Ground, Flared, Ferrule ... 155
P-2012 Unions ... 155
P-2013 Flanged Connections ... 155
P-2014 Waterproofing of Openings ... 156
P-2015 Workmanship ... 156
P-2016 Inspection and Tests ... 156
P-2017 Drains and Vents ... 156
P-2018 Building Sewers ... 156
P-2019 Water Piping ... 156
P-2020 Definitions ... 156

CHAPTER 21—Plumbing Materials

Section

P-2101 Minimum Standards ... 165
P-2102 Drain Waste and Vent Materials ... 165
P-2103 Building Sewer ... 165
P-2104 Water Piping ... 165

P-2105 Pipe Standards 166
P-2106 Weights of Lead and Copper 166
P-2107 Cleanouts 166
P-2108 Plumbing Fixtures 166
P-2109 Material for Fixture Accessories 166
P-2110 Traps 166
P-2111 Backwater Valves 167

CHAPTER 22—Plumbing, Drainage, Waste and Vent Systems (DWV)

Section

P-2201 General 169
P-2202 Materials 169
P-2203 Joints and Connections 169
P-2204 Trenching and Backfilling 171
P-2205 Determining Drainage Fixture Units 171
P-2206 Drainage System 171
P-2207 Vent Systems 176
P-2208 Testing the Drainage, Waste and Vent System 180

CHAPTER 23—Plumbing Fixtures, Traps and Receptors

Section

P-2301 Fixtures 191
P-2302 Strainers 191
P-2303 Tail Pieces 191
P-2304 Access to Connections 191
P-2305 Installation 191
P-2306 Traps, General 191
P-2307 Size 192
P-2308 Seals 192
P-2309 Combination Fixtures 192
P-2310 Length of Trap Arm 192
P-2311 Cleanout Waived 192
P-2312 Receptors 192
P-2313 Prohibited Receptors 192
P-2314 Directional Fittings 192
P-2315 Showers 192
P-2316 Shower Receptors 193
P-2317 Shower Walls 193
P-2318 Lavatories 193
P-2319 Water Closets 193
P-2320 Bathtubs 194
P-2321 Sinks 194
P-2322 Laundry Tubs 194
P-2323 Food-waste Grinder 194
P-2324 Dishwashing Machines 195
P-2325 Clothes Washer 195
P-2326 Floor Drains 195
P-2327 Whirlpool Bathtubs 195

CHAPTER 24—Water Service and Distribution

Section

P-2401 General ... 197
P-2402 Protection of Potable Water Supply ... 197
P-2403 Water Service ... 197
P-2404 Joints and Connections ... 198
P-2405 Valves ... 199
P-2406 Water-distribution System ... 200
P-2407 Support ... 201
P-2408 Water Heater ... 201
P-2409 Testing Water-supply Systems ... 201

CHAPTER 25—Sewers and Private or Individual Sewage Disposal Systems

Section

P-2501 General ... 207
P-2502 Building Sewer Size ... 207
P-2503 Disposal Systems ... 207
P-2504 Location ... 208
P-2505 Septic Tank Capacity ... 208
P-2506 Septic Tank Design and Construction ... 208
P-2507 Disposal Area ... 209
P-2508 Drain Lines ... 209
P-2509 Seepage Pits ... 209
P-2510 Combined Seepage Pits and Disposal Fields ... 210

PART VI—ELECTRICAL

PART VII—ENERGY CONSERVATION

PART VIII—STANDARDS

CHAPTER 26—Standards

Section

S-26.000 General ... 217
S-26.001 Abbreviations ... 217
S-26.208 Shower Compartment Finish ... 219
S-26.209 Glazing Materials ... 219
S-26.218 Fire Test ... 219
S-26.219 Fire Test ... 219
S-26.302 Foundations ... 219
S-26.308 Preservatives ... 220
S-26.401 Wall Construction ... 221
S-26.501 Wall Covering ... 225
S-26.601 Floors ... 225

S-26.701 Roof-Ceiling ... 225
S-26.801 Roof Covering ... 225
S-26.901 Chimneys and Fireplaces ... 226
S-26.1001 Mechanical Materials ... 226
S-26.1101 Mechanical Equipment ... 227
S-26.1603 Insulation ... 228
S-26.2001 Plumbing, General ... 228
S-26.2103 Sewer Pipe ... 230
S-26.2104 Water Piping ... 230
S-26.2105 Miscellaneous Plumbing ... 230

Appendix A ... 233

Appendix B ... 241

Appendix C ... 301

Appendix D ... 315

Appendix E ... 317

Index ... 343

UNIFORM BUILDING CODE

1988 Edition

The following pages are a reproduction of the UBC requirements for residential occupancies exceeding 10 persons or two families.* Consult the actual code book for associated references for design, materials, and construction, as well as for exceptions.

*Reproduced from the 1988 edition of the Uniform Building Code, copyright 1988, with permission of the publishers, the International Conference of Building Officials.

Chapter 12
REQUIREMENTS FOR GROUP R OCCUPANCIES

Group R Occupancies Defined

Sec. 1201. Group R Occupancies shall be:

Division 1. Hotels and apartment houses.

Convents and monasteries (each accommodating more than 10 persons).

Division 2. Not used.

Division 3. Dwellings and lodging houses.

For occupancy separations, see Table No. 5-B.

A complete code for construction of detached one- and two-family dwellings is in Appendix Chapter 12 of this code. When adopted, as set forth in Section 103, it will take precedence over the requirements set forth in Parts I through X and Chapter 60 of this code.

Construction, Height and Allowable Area

Sec. 1202. (a) **General.** Buildings or parts of buildings classed in Group R because of the use or character of the occupancy shall be limited to the types of construction set forth in Tables No. 5-C and No. 5-D and shall not exceed, in area or height, the limits specified in Sections 505, 506 and 507.

(b) **Special Provisions.** Walls and floors separating dwelling units in the same building shall be of not less than one-hour fire-resistive construction.

Group R, Division 1 Occupancies more than two stories in height or having more than 3000 square feet of floor area above the first story shall be of not less than one-hour fire-resistive construction throughout except as provided in Section 1705 (b) 2.

Storage or laundry rooms that are within Group R, Division 1 Occupancies that are used in common by tenants shall be separated from the rest of the building by not less than one-hour fire-resistive occupancy separation.

For Group R, Division 1 Occupancies with a Group B, Division 1 parking garage in the basement or first floor, see Section 702 (a).

For attic space partitions and draft stops, see Section 2516 (f).

Location on Property

Sec. 1203. For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 504 and Part IV.

Exits and Emergency Escapes

Sec. 1204. Stairs, exits and smokeproof enclosures shall be as specified in Chapter 33.

Basements in dwelling units and every sleeping room below the fourth story shall have at least one operable window or door approved for emergency escape or rescue which shall open directly into a public street, public alley, yard or exit court. The units shall be operable from the inside to provide a full clear opening without the use of separate tools.

All escape or rescue windows shall have a minimum net clear openable area of 5.7 square feet. The minimum net clear openable height dimension shall be 24 inches. The minimum net clear openable width dimension shall be 20 inches. When windows are provided as a means of escape or rescue they shall have a finished sill height not more than 44 inches above the floor.

Bars, grilles, grates or similar devices may be installed on an emergency escape or rescue windows or doors, provided:

1. Such devices are equipped with approved release mechanisms which are openable from the inside without the use of a key or special knowledge or effort; and
2. The building is equipped with smoke detectors installed in accordance with Section 1210.

Light, Ventilation and Sanitation

Sec. 1205. (a) **General.** For the purpose of determining the light or ventilation required by this section, any room may be considered as a portion of an adjoining room when one half of the area of the common wall is open and unobstructed and provides an opening of not less than one tenth of the floor area of the interior room or 25 square feet, whichever is greater.

Exterior openings for natural light or ventilation required by this section shall open directly onto a street or public alley or a yard or court located on the same lot as the building.

EXCEPTION: Required windows may open into a roofed porch where the porch:

1. Abuts a street, yard or court; and
2. Has a ceiling height of not less than 7 feet; and
3. Has the longer side at least 65 percent open and unobstructed.

(b) **Light.** All guest rooms, dormitories and habitable rooms within a dwelling unit shall be provided with natural light by means of exterior glazed openings with an area not less than one tenth of the floor area of such rooms with a minimum of 10 square feet.

(c) **Ventilation.** All guest rooms, dormitories and habitable rooms within a dwelling unit shall be provided with natural ventilation by means of openable exterior openings with an area of not less than one twentieth of the floor area of such rooms with a minimum of 5 square feet.

In lieu of required exterior openings for natural ventilation, a mechanical ventilating system may be provided. Such system shall be capable of providing two air changes per hour in all guest rooms, dormitories, habitable rooms and in public corridors. One fifth of the air supply shall be taken from the outside.

All bathrooms, water closet compartments, laundry rooms and similar rooms shall be provided with natural ventilation by means of openable exterior openings with an area not less than one twentieth of the floor area of such rooms with a minimum of 1½ square feet.

In lieu of required exterior openings for natural ventilation in bathrooms containing a bathtub or shower or combination thereof, laundry rooms, and

similar rooms, a mechanical ventilation system connected directly to the outside capable of providing five air changes per hour shall be provided. The point of discharge of exhaust air shall be at least 5 feet from any mechanical ventilating intake. Bathrooms which contain only a water closet or lavatory or combination thereof, and similar rooms may be ventilated with an approved mechanical recirculating fan or similar device designed to remove odors from the air.

(d) **Sanitation.** Every building shall be provided with at least one water closet. Every hotel or subdivision thereof where both sexes are accommodated shall contain at least two separate toilet facilities which are conspicuously identified for male or female use, each of which contains at least one water closet.

EXCEPTION: Hotel guest rooms may have one unidentified toilet facility.

Additional water closets shall be provided on each floor for each sex at the rate of one for every additional 10 guests, or fractional part thereof, in excess of 10.

Every dwelling unit shall be provided with a kitchen equipped with a kitchen sink. Every dwelling unit and every lodging house shall be provided with a bathroom equipped with facilities consisting of a water closet, lavatory and either a bathtub or shower. Each sink, lavatory and either a bathtub or shower shall be equipped with hot and cold running water necessary for its normal operation.

For other requirements on water closets, see Section 511.

Yards and Courts

Sec. 1206. (a) **Scope.** This section shall apply to yards and courts having required windows opening therein.

(b) **Yards.** Every yard shall be not less than 3 feet in width for one-story and two-story buildings. For buildings more than two stories in height, the minimum width of the yard shall be increased at the rate of 1 foot for each additional story. For buildings exceeding 14 stories in height, the required width of yard shall be computed on the basis of 14 stories.

(c) **Courts.** Every court shall be not less than 3 feet in width. Courts having windows opening on opposite sides shall be not less than 6 feet in width. Courts bounded on three or more sides by the walls of the building shall be not less than 10 feet in length unless bounded on one end by a public way or yard. For buildings more than two stories in height, the court shall be increased 1 foot in width and 2 feet in length for each additional story. For buildings exceeding 14 stories in height, the required dimensions shall be computed on the basis of 14 stories.

Adequate access shall be provided to the bottom of all courts for cleaning purposes. Every court more than two stories in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet in area and leading to the exterior of the building unless abutting a yard or public way. The construction of the air intake shall be as required for the court walls of the building, but in no case shall be less than one-hour fire resistive.

Room Dimensions

Sec. 1207. (a) **Ceiling Heights.** Habitable space shall have a ceiling height of not less than 7 feet 6 inches except as otherwise permitted in this section.

Kitchens, halls, bathrooms and toilet compartments may have a ceiling height of not less than 7 feet measured to the lowest projection from the ceiling. Where exposed beam ceiling members are spaced at less than 48 inches on center, ceiling height shall be measured to the bottom of these members. Where exposed beam ceiling members are spaced at 48 inches or more on center, ceiling height shall be measured to the bottom of the deck supported by these members, provided that the bottom of the members is not less than 7 feet above the floor.

If any room in a building has a sloping ceiling, the prescribed ceiling height for the room is required in only one-half the area thereof. No portion of the room measuring less than 5 feet from the finished floor to the finished ceiling shall be included in any computation of the minimum area thereof.

If any room has a furred ceiling, the prescribed ceiling height is required in two thirds the area thereof, but in no case shall the height of the furred ceiling be less than 7 feet.

(b) **Floor Area.** Every dwelling unit shall have at least one room which shall have not less than 120 square feet of floor area. Other habitable rooms except kitchens shall have an area of not less than 70 square feet. Efficiency dwelling units shall comply with the requirements of Section 1208.

(c) **Width.** Habitable rooms other than a kitchen shall be not less than 7 feet in any dimension.

Efficiency Dwelling Units

Sec. 1208. An efficiency dwelling unit shall conform to the requirements of the code except as herein provided:

1. The unit shall have a living room of not less than 220 square feet of superficial floor area. An additional 100 square feet of superficial floor area shall be provided for each occupant of such unit in excess of two.

2. The unit shall be provided with a separate closet.

3. The unit shall be provided with a kitchen sink, cooking appliance and refrigeration facilities, each having a clear working space of not less than 30 inches in front. Light and ventilation conforming to this code shall be provided.

4. The unit shall be provided with a separate bathroom containing a water closet, lavatory and bathtub or shower.

Shaft and Exit Enclosures

Sec. 1209. Exits shall be enclosed as specified in Chapter 33.

Elevator shafts, vent shafts, dumbwaiter shafts, clothes chutes and other vertical openings shall be enclosed and the enclosure shall be as specified in Section 1706.

In nonsprinklered Group R, Division 1 Occupancies, corridors serving an occupant load of 10 or more shall be separated from corridors and other areas on adjacent floors by not less than approved fixed wired glass set in steel frames or by 20-minute smoke- and draft-control assemblies which are automatic-closing by smoke detection.

Smoke Detectors and Sprinkler Systems

Sec. 1210. (a) **Smoke Detectors.** 1. **General.** Dwelling units and hotel or lodging house guest rooms that are used for sleeping purposes shall be provided with smoke detectors. Detectors shall be installed in accordance with the approved manufacturer's instructions.

2. **Additions, alterations or repairs to Group R Occupancies.** When the valuation of an addition, alteration or repair to a Group R Occupancy exceeds $1000.00 and a permit is required, or when one or more sleeping rooms are added or created in existing Group R Occupancies, smoke detectors shall be installed in accordance with Subsections 3, 4 and 5 of this section.

3. **Power source.** In new construction, required smoke detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke detectors may be battery operated when installed in existing buildings, or in buildings without commercial power, or in buildings which undergo alterations, repairs or additions regulated by Subsection 2 of this section.

4. **Location within dwelling units.** In dwelling units, detectors shall be mounted on the ceiling or wall at a point centrally located in the corridor or area giving access to each separate sleeping area. When the dwelling unit has more than one story and in dwellings with basements, a detector shall be installed on each story and in the basement. In dwelling units where a story or basement is split into two or more levels, the smoke detector shall be installed on the upper level, except that when the lower level contains a sleeping area, a detector shall be installed on each level. When sleeping rooms are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. In dwelling units where the ceiling height of a room open to the hallway serving the bedrooms exceeds that of the hallway by 24 inches or more, smoke detectors shall be installed in the hallway and in the adjacent room. Detectors shall sound an alarm audible in all sleeping areas of the dwelling unit in which they are located.

5. **Location in efficiency dwelling units and hotels.** In efficiency dwelling units, hotel suites and in hotel sleeping rooms, detectors shall be located on the ceiling or wall of the main room or hotel sleeping room. When sleeping rooms within an efficiency dwelling unit or hotel suite are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. When actuated, the detector shall sound an alarm audible within the sleeping area of the dwelling unit, hotel suite or sleeping room in which it is located.

(b) **Sprinkler and Standpipe Systems.** When required by other provisions of this code, automatic sprinkler systems and standpipes shall be installed as specified in Chapter 38.

Fire Alarm Systems

Sec. 1211. A manual and automatic approved fire alarm system shall be installed in apartment houses that are three or more stories in height or contain

more than 15 dwelling units and in hotels three or more stories in height or containing 20 or more guest rooms, in accordance with the Fire Code.

EXCEPTIONS: 1. A fire alarm system need not be installed in buildings not over two stories in height when all individual dwelling units and contiguous attic and crawl spaces are separated from each other and from public or common areas by at least one-hour fire-resistive occupancy separations and each individual dwelling unit or guest room has an exit direct to a public way, exit court or yard, exterior stairway or exterior exit balcony.

2. A separate fire alarm system need not be installed in buildings which are protected throughout by an approved supervised fire sprinkler system installed in accordance with U.B.C. Standard No. 38-1 and having a local alarm to notify all occupants.

For the purposes of this section, area separation walls shall not define separate buildings.

Heating

Sec. 1212. Every dwelling unit and guest room shall be provided with heating facilities capable of maintaining a room temperature of 70°F. at a point 3 feet above the floor in all habitable rooms.

Special Hazards

Sec. 1213. Chimneys and heating apparatus shall conform to the requirements of Chapter 37 and the Mechanical Code.

The storage and handling of gasoline, fuel oil or other flammable liquids in Division 1 Occupancies shall be in accordance with the Fire Code.

In Division 1 Occupancies, doors leading into rooms in which Class I flammable liquids are stored or used shall be protected by a fire assembly having a one-hour fire-protection rating. Such fire assembly shall be self-closing and shall be posted with a sign on each side of the door in 1-inch block letters stating: FIRE DOOR—KEEP CLOSED.

Every room containing a boiler, central heating plant or hot-water supply boiler in Division 1 Occupancies shall be separated from the rest of the building by not less than a one-hour fire-resistive occupancy separation.

EXCEPTION: A separation shall not be required for such rooms with equipment serving only one dwelling unit.

Access to Buildings and Facilities

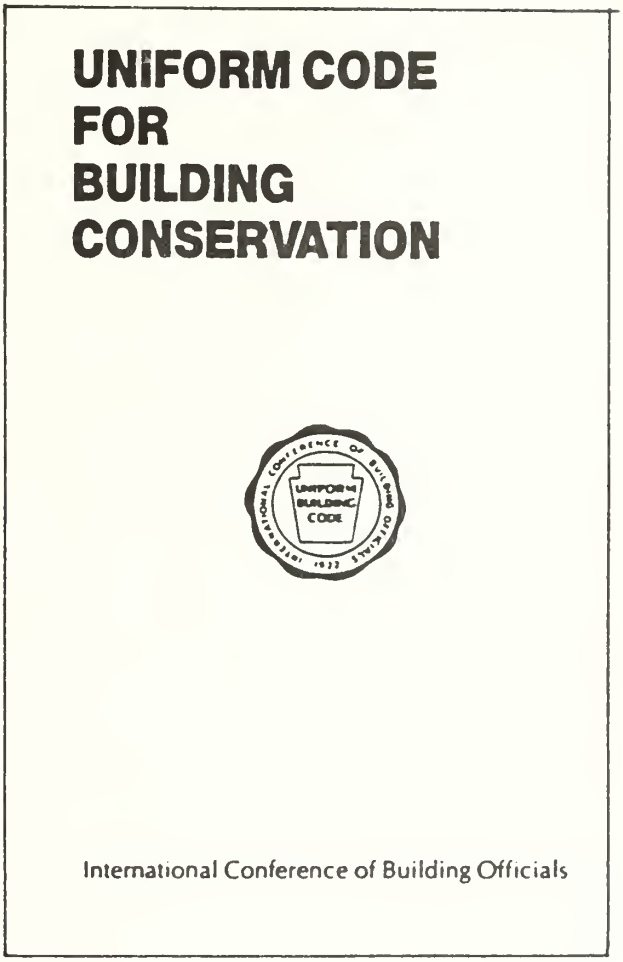
Sec. 1214. Buildings containing more than 20 dwelling units or 20 guest rooms shall be accessible to the physically handicapped by a level entry, ramp or elevator. The number of dwelling units or guest rooms accessible to the physically handicapped shall be not less than the following.

21 through 99 — one unit
100 and over — one, plus one for each additional 100 units or fraction thereof

1988 EDITION **1214**

To determine the total number of accessible units, more than one structure on a building site shall be considered as one building. Habitable rooms, bathrooms, toilet compartments, halls and utility rooms in units that are required to be accessible to the physically handicapped shall be accessible by level floors, ramps or elevators, and doorways to such rooms shall have a clear unobstructed width of not less than 32 inches.

Toilet facilities in accessible units shall comply with Section 511.



The following pages are a reproduction of the outline of contents as well as the minimum requirements for existing buildings, change of occupancy, historic structures, and residential occupancies found in the UCBC.* Consult the actual code book for specific requirements for design, materials, and construction, as well as for exceptions.

*Reproduced from the 1985 edition of the Uniform Code for Building Conservation, copyright 1985, with permission of the publishers, the International Conference of Building Officials.

Outline of Contents by Parts, Chapters and Selections

Chapter 1 TITLE AND SCOPE
Chapter 2 ENFORCEMENT AND PERMITS
Chapter 3 DEFINITIONS
Chapter 4 MINIMUM STANDARDS FOR EXISTING BUILDINGS
Chapter 5 MINIMUM PROVISIONS FOR CHANGE OF OCCUPANCY
Chapter 6 HISTORIC STRUCTURES
Chapter 7 REQUIREMENTS FOR GROUP R OCCUPANCIES

APPENDIX

Appendix Chapter 1 EARTHQUAKE HAZARD REDUCTION IN EXISTING UNREINFORCED MASONRY BUILDINGS
Appendix Chapter 2 EXISTING HIGH-RISE BUILDINGS
Appendix Chapter 3 HANDICAPPED ACCESSIBILITY
Appendix Chapter 4 ENERGY CONSERVATION

U.C.B.C. GUIDELINES

U.C.B.C.-1 EXIT SYSTEMS
U.C.B.C.-2 FIRE RATINGS OF ARCHAIC MATERIALS
U.C.B.C.-3 ALLOWABLE STRESSES FOR ARCHAIC MATERIALS
U.C.B.C.-4 ELECTRICAL GUIDELINE
U.C.B.C.-5 PLUMBING DWV GUIDELINE

Chapter 4

MINIMUM STANDARDS FOR EXISTING BUILDINGS

General

Sec. 401. (a) **General.** Existing buildings or structures within the scope of this code shall meet the minimum standards set forth in this chapter, as well as any specific occupancy requirements set forth in this code. Buildings and structures undergoing a change of occupancy or a change in the character of its use shall also meet the requirements of Chapter 5. Historic buildings and structures shall meet the requirements of Chapter 6 and the provisions of this chapter where applicable. Buildings or structures shall meet the minimum level of performance specified in this chapter through compliance with the specific provisions of this code. The building official may accept compliance alternatives specified in the U.C.B.C. Guidelines or other documents deemed appropriate.

(b) **Heights and Areas.** The heights and areas of existing buildings or structures shall be acceptable, provided the requirements of this chapter are satisfied. Requirements for buildings and structures undergoing a change of occupancy shall be as provided in Chapter 5.

Life Safety

Sec. 402. (a) **General.** Safety to life in existing buildings and structures shall meet the intent of the building code. The provisions of this section shall be deemed as meeting the intent of the Building Code for existing buildings, provided that none of the life safety features required by the code under which the building was constructed will be reduced below the level established by that code or equivalent provisions of the currently adopted Building Code. Exit system capacity and the arrangement of exits shall comply with the requirements of the building code. Exit systems complying with Subsections (b) through (d) shall be deemed as meeting the intent of the Building Code for existing buildings, provided that an exit system evaluated under the provisions of this code is judged by the building official to be at least equivalent to the exit system which was required by the code under which the building was constructed or equivalent provisions of the currently adopted Building Code. Exit system capacity may be evaluated using the procedures included in the U.C.B.C. Guidelines.

(b) **Exits.** All elements of the exit system shall be of sufficient size, width and arrangement to provide safe and adequate means of egress. Every required exit shall have access to a public way, directly or through yards, courts or similar spaces, and such access shall be permanently maintained clear of any obstruction which would impede egress.

(c) **Number of Exits.** Occupants of every floor above the first story and basements shall have access to at least two separate exits. When approved by the building official, one of the exits may be an exterior fire escape complying with Subsection (e). A fire escape shall not be substituted for a stairway which was required by the code under which the building was constructed.

EXCEPTION: In all occupancies, second stories with an occupant load of less than 10 may have one exit.

(d) **Corridors.** Corridors serving as a part of the exit system which have an occupant load of 30 or more in a Group A, B, E, I or H Occupancy or an occupant

load of 10 or more in a Group R, Division 1 Occupancy shall have walls and ceilings of not less than one-hour fire-resistive construction. Existing walls and ceilings surfaced with wood lath and plaster or 1/2-inch-thick gypsum wallboard may be permitted in lieu of one-hour fire-resistive construction, provided the surfaces are in good condition.

Door openings into such corridors shall be protected by a tight-fitting smoke- and draft-control assembly having a fire-protection rating of not less than 20 minutes when such opening protection was required by the code under which the building was constructed. Door closing devices, door gaskets and other requirements imposed by the code under which the building was constructed shall be maintained. When the building was constructed under a code which did not require 20 minute smoke- and draft-control assemblies, doorway openings shall be protected by doors having a fire-protection rating of not less than 20 minutes or by a minimum 1 3/8-inch-thick solid-bonded wood-core door or an equivalent insulated steel door. In such case, the frames need not have a fire-resistive time period. Doors shall be maintained self-closing or shall be automatic closing by activation of a smoke detector.

Transoms and openings other than doors from corridors to rooms shall be protected as required by the Building Code. When the code under which the building was constructed permitted unprotected transoms or other unprotected openings, other than doors, such transoms or openings shall be covered with a minimum of 3/4-inch-thick plywood or 1/2-inch-thick gypsum wallboard or equivalent material on the room side. Openings with fixed wired glass set in steel frames are permitted in corridor walls and ceilings.

> **EXCEPTION:** Existing corridor walls, ceilings and opening protection not in compliance with the above may be continued when the building is protected with an approved automatic sprinkler system throughout. Such sprinkler system may be supplied from the domestic water-supply system, provided the system is of adequate pressure, capacity and sizing for the combined domestic and sprinkler requirements.

(e) **Fire Escapes.** Existing fire escapes complying with this section may be accepted by the building official as one of the required exits. The fire escape shall not be the primary or the only exit. Fire escapes shall not take the place of stairways required by the codes under which the building was constructed. Fire escapes shall be subject to reinspection as required by the building official. The building official may require documentation to show compliance with the requirements of this section.

Fire escapes shall comply with the following:

1. Access from a corridor shall not be through an intervening room.

   EXCEPTION: Access through an intervening room may be permitted if the intervening door is not lockable and an exit sign is installed above the door which will direct occupants to the fire escape.

2. All openings in an exterior wall below or within 10 feet, measured horizontally, of an existing fire escape serving a building over two stories in height shall be protected by a self-closing fire assembly having a three-fourths-hour fire protection rating. When located within a recess or vestibule, adjacent enclosure walls shall be of not less than one-hour fire-resistive construction.
3. Egress from the building shall be by an opening having a minimum clear

width and height of not less than 29 inches. Such openings shall be openable from the inside without the use of a key or special knowledge or effort. The sill of an opening giving access to the fire escape shall be not more than 30 inches above the floor of the building or balcony.

4. Fire escape stairways and their balconies shall support their dead load plus a live load of not less than 100 pounds per square foot or concentrated load of 300 pounds placed anywhere on the balcony or stairway so as to produce the maximum stress conditions. The stairway shall have a pitch not to exceed 60 degrees from the horizontal and shall have a minimum width of 18 inches. The stairway shall be provided with a top and intermediate railing on each side. Treads shall be not less than 4 inches in width and the rise between treads shall not exceed 10 inches. All stairway and balcony railings shall support a horizontally applied force of not less than 50 pounds per lineal foot of railing or a concentrated load of 200 pounds placed anywhere on the railing so as to produce the maximum stress conditions.
5. Fire escape balconies shall be not less than 44 inches in width with no floor opening greater than 5/8 inch in width except the stairway opening. Stairway openings in such balconies shall be not less than 22 inches by 44 inches. The guardrail of each balcony shall be not less than 36 inches high with not more than 9 inches between intermediate rails.
6. Fire escapes shall extend to the roof or provide an approved gooseneck ladder between the top floor landing and the roof when serving buildings four or more stories in height having roofs with a slope not exceeding 4 in 12. Such ladders shall be designed and connected to the building to withstand a horizontal force of 100 pounds per lineal foot; each rung shall support a concentrated load of 500 pounds placed anywhere on the rung so as to produce the maximum stress conditions. All ladders shall be at least 15 inches in clear width, be located within 12 inches of the building, and shall be placed flatwise relative to the face of the building. Ladder rungs shall be 3/4 inch in diameter and shall be located 10 inches to 12 inches on center. Openings for roof access ladders through cornices and similar projections shall have minimum dimensions of 30 inches by 33 inches.
7. The lowest balcony shall be not more than 18 feet from the ground. Fire escapes shall extend to the ground or be provided with counterbalanced stairs reaching to the ground.
8. Fire escapes shall be kept clear and unobstructed at all times and maintained in good working order.
9. The fire escape shall have a clearance from electrical service conductors as required by the Electrical Code.

(f) **Stairways.** Existing winding or spiral stairways may be accepted as one exit from a building, provided that a complying handrail is located at the stair's outside perimeter. (Also see Section 405.) A winding or spiral stairway may not be the principal exit when used in conjunction with a fire escape as a second exit. Exit width shall comply with the Building Code. Circular stairways complying with the Building Code shall be acceptable as an exit.

Structural Safety

Sec. 403. A building or structure or its individual structural members that

exceed the limits established by the Dangerous Building Code shall be replaced or strengthened in order that the building, structure or individual structural members will comply with the requirements of the Building Code for new construction. Roofs, floors, walls, foundations and all stuctural components of buildings or structures shall be capable of resisting the forces and loads specified in Chapter 23 of the Building Code.

See Appendix Chapter 1 for unreinforced masonry buildings.

Weather Protection

Sec. 404. (a) **General.** Every building shall be weather protected so as to provide shelter for the occupants against the elements and to exclude dampness.

(b) **Roofs.** The roof of every building or structure shall provide weather protection for the building. All devices which were provided or are required to prevent ponding or flooding or to convey the roof water shall be capable of fulfilling that purpose.

(c) **Other Enclosing Elements.** All weather-exposed surfaces of every existing building or structure shall provide weather protection.

Other Safety Features

Sec. 405. (a) **Stairs.** 1. **Rise and Run.** The largest tread run within any flight of stairs shall not exceed the smallest by more than 3/8 inch. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch.

2. **Handrails.** A. Every stairway shall have at least one handrail.

EXCEPTION: A handrail is not required for existing stairs having less than 4 risers.

B. Spiral and winding stairways shall have a handrail on the outside perimeter.

(b) **Guardrails.** All unenclosed floor and roof openings, open and glazed sides of stairways, landings and ramps, balconies or porches which are more than 30 inches above grade or floor below, and roofs used for other than service of the building shall be protected by a guardrail.

EXCEPTION: Guardrails need not be provided at the following locations:

1. On the loading side of loading docks.
2. On the auditorium side of a stage or enclosed platform.
3. On private stairways 30 inches or less in height.

Existing guardrails, other than guardrails located on the open side of a stairway, which are at least 36 inches in height shall be permitted to remain. Guardrails lower than 36 inches in height shall be augmented or corrected to raise their effective height to 36 inches. Guardrails for stairways, exclusive of their landings, may have a height which is not less than 30 inches measured above the nosing of treads. When approved by the building official, the spacing between existing intermediate railings or openings in existing ornamental patterns may be accepted. See Section 607 for existing guardrails in historical structures.

(c) **Glazing.** The installation or replacement of glass shall be as required for new construction by the Building Code.

(d) **Electrical.** The electrical service, lines, switches, outlets, fixtures and fixture coverings and supports in every building or structure shall be in good repair. Broken, loose, frayed, inoperative, defective or missing portions shall be repaired or replaced. All unsafe conditions shall be corrected.

(e) **Plumbing.** Leaking drain or supply lines shall be repaired or replaced. All unsafe conditions shall be corrected. Any cross connections or siphonage between fixtures shall be corrected.

(f) **Mechanical.** Mechanical systems shall have any unsafe conditions corrected.

Chapter 5

MINIMUM PROVISIONS FOR CHANGE OF OCCUPANCY

General

Sec. 501. (a) **Change of Occupancy.** The character of the occupancy of existing buildings and structures may be changed, provided the building or structure meets the requirements of this chapter and the requirements of Chapter 4. Where no specific requirements are included herein, the building or structure shall comply with the Building Code.

Every change of occupancy to one classified in a different group or a different division of the same group shall require a new Certificate of Occupancy regardless of whether any alterations to the building are required by this code.

If the building or portion thereof does not conform to the requirements of this code for the proposed occupancy group or division, the building or portion thereof shall be made to conform to the Building Code except as specified in this code. The building official may accept compliance alternatives based on the U.C.B.C. Guidelines. The building official may issue a new Certificate of Occupancy stating that the building complies with this code.

(b) **Hazard Category Classifications.** The relative degree of hazard between different occupancy groups or between divisions of the same group shall be as set forth in the hazard category classifications, Tables No. 5-A through No. 5-E. An existing building may have its occupancy changed to an occupancy within the same hazard group or to an occupancy in a lesser hazard group without complying to all of the provisions of this chapter. An existing building shall comply with the requirements of the Building Code, except as specified in this chapter, when a change in occupancy will place it in a higher hazard group or when the occupancy is changed to Group A, Division 1 or 2, Group E, H or I.

Heights and Areas

Sec. 502. Heights and areas of buildings and structures shall meet the requirements of the Building Code for the new occupancy.

EXCEPTION: Existing buildings exceeding the maximum allowable heights and areas permitted for new buildings may undergo a change of occupancy if the hazard level of the new occupancy is equal to or less than the existing hazard group as shown in Table No. 5-A.

Fire Safety

Sec. 503. (a) **General.** When a change of occupancy is made to a higher hazard group as shown in Table No. 5-A, all elements of the exit system shall comply with the requirements of the Building Code.

EXCEPTIONS: 1. Existing exit corridors and stairways meeting the requirements of Chapter 4 may be used.

2. Exit system elements may meet the compliance alternatives contained in the U.C.B.C. Guidelines.

(b) **Existing Exit Systems.** Existing exit systems complying with Chapter 4 shall be accepted if the occupancy change is to an equal or lesser hazard group when evaluated in accordance with Table No. 5-B.

(c) **Separation of Occupancies.** When a change of occupancy is made to a

higher hazard group as shown in Table No. 5-C, occupancy separations shall be provided as specified in the Building Code. When approved by the building official, existing wood lath and plaster in good condition or 1/2-inch-thick gypsum wallboard may be accepted where a one-hour occupancy separation is required.

(d) **Enclosure of Vertical Shafts.** 1. **General.** Vertical shafts may be designed to meet the requirements of atriums as required by the Building Code or the requirements of this section.

2. **Stairways.** Interior stairways shall be enclosed as required by the Building Code when a change of occupancy is made to a higher hazard group as shown in Table No. 5-D.

EXCEPTIONS: 1. In other than Group I Occupancies, an enclosure will not be required for openings serving only one adjacent floor and not connected with corridors or stairways serving other floors.

2. Existing stairways not enclosed need not be enclosed in a continuous vertical shaft if each story is separated from other stories by one-hour fire-resistive construction or approved wired glass set in steel frames and all exit corridors are sprinklered. The openings between the corridor and occupant space shall have at least one sprinkler head above the openings on the tenant side. The sprinkler system may be supplied from the domestic water supply system, provided the system is of adequate pressure, capacity and sizing for the combined domestic and sprinkler requirements.

3. **Other Vertical Shafts.** Interior vertical shafts, including, but not limited to, elevator hoistways, service and utility shafts, shall be enclosed with a minimum of one-hour fire-resistive construction.

EXCEPTIONS: 1. Vertical openings, other than stairways, need not be enclosed if the entire building is provided with an approved automatic sprinkler system.

2. Where one-hour fire-resistive floor construction is required, vertical shafts need not be enclosed when such shafts are blocked at every floor level by the installation of not less than two full inches of solid wood or equivalent construction.

4. **Openings into Vertical Enclosures.** All openings into such shafts shall be protected by fire assemblies having a fire-protection rating of not less than one hour and shall be maintained self-closing or shall be automatic closing by actuation of a smoke detector. All other openings shall be fire protected in an approved manner. Existing fusible link-type automatic door-closing devices may be permitted if the fusible link rating does not exceed 135°F.

Property Protection

Sec. 504. (a) **Fire Resistance of Walls.** Exterior walls shall have fire resistance and opening protection as set forth in the Building Code. This provision shall not apply to walls at right angles to the property line.

EXCEPTIONS: 1. Where a fire-resistive rating greater than two hours is required for a building of any type of construction, existing noncombustible exterior walls having a fire-resistive rating equivalent to two hours as determined by U.C.B.C. Guideline 2 may be accepted, provided:

A. The building is classified as a Group A, Division 3; Group B, Division 1 or Group B, Division 2 Occupancy, and

B. The building does not exceed three stories in height.

2. Existing exterior walls shall be accepted if the occupancy is changed to a hazard group which is equal to or less than the existing occupancy as defined in Table No. 5-D.

(b) **Opening Protection.** Openings in exterior walls shall be protected as

required by the Building Code. When openings in the exterior walls are required to be protected due to distance from the property line, the sum of the area of such openings shall not exceed 50 percent of the total area of the wall in each story.

EXCEPTIONS: 1. Protected openings shall not be required for Group R, Division 1 Occupancies which do not exceed three stories in height and which are located not less than 3 feet from the property line.

2. Where opening protection is required, an automatic fire-extinguishing system throughout may be substituted for opening protection.

3. Opening protection may be omitted when the change of occupancy is to an equal or lower hazard classification in accordance with Table No. 5-B.

Structural Safety

Sec. 505. (a) **Vertical Loads.** Buildings and structures shall comply with the requirements of the Building Code for vertical load.

EXCEPTIONS: 1. Analysis and test methods for evaluation of existing materials may use the methods specified in the code under which the building was constructed, or other standards as approved by the building official.

2. Investigation of archaic materials shall be in accordance with U.C.B.C. Guidelines.

3. Existing roofs may be retained provided any unsafe or overloaded conditions are corrected and where the roof dead load is not increased by use, reroofing or added equipment.

(b) **Earthquake Loads.** Buildings undergoing a change of occupancy shall meet the earthquake regulations of the Building Code for the new occupancy.

EXCEPTIONS: 1. A building of Type I construction shall be individually evaluated for safety.

2. Existing buildings may undergo a change of occupancy if the hazard group is equal to or less than the existing occupancy as shown in Table No. 5-E.

3. Unreinforced masonry bearing wall buildings may be strengthened in accordance with Appendix Chapter 1.

(c) **Wind Loads.** Buildings shall not be considered as dangerous buildings when subjected to the requirements of the Building Code.

Light and Ventilation

Sec. 506. Light and ventilation shall comply with the requirements of the Building Code.

TABLE NO. 5-A
HAZARD CATEGORIES AND CLASSIFICATIONS
HEIGHTS AND AREAS

Relative Hazard	Occupancy Classification
1.	A-1, I-3 (highest hazard group)
2.	A-2, A-2.1, I-1, I-2
3.	A-3, A-4, B, E, R-1
4.	R-3, M (lowest hazard group)

TABLE NO. 5-B
HAZARD CATEGORIES AND CLASSIFICATIONS
LIFE SAFETY AND EXITS

Relative Hazard	Occupancy Classification
1.	A-1, A-2, A-2.1, E, I, H-1, H-2 (highest hazard group)
2.	A-3
3.	R-1, R-3, B-2 dining and drinking establishments
4.	B-2, all others, B-4, H other than H-1 and H-2
5.	B-1, B-3
6.	M (lowest hazard group)

TABLE NO. 5-C
HAZARD CATEGORIES AND CLASSIFICATIONS
OCCUPANCY SEPARATIONS

Relative Hazard	Occupancy Classification
1.	H, B-1, I (Highest Hazard Group)
2.	A, B-2, B-3, B-4
3.	E
4.	R-1, M
5.	R-3 (lowest hazard group)

TABLE NO. 5-D
HAZARD CATEGORIES AND CLASSIFICATION
EXPOSURE OF EXTERIOR WALLS
AND STAIRWAY ENCLOSURES

Relative Hazard	Occupancy Classification
1.	H (highest hazard group)
2.	B-2
3.	A, E, I
4.	B-1, B-2 other than mercantile and warehouses, R
5.	B-4, M (lowest hazard group)

TABLE NO. 5-E
HAZARD CATEGORIES AND CLASSIFICATIONS
EARTHQUAKE SAFETY

Relative Hazard	Occupancy Classification
1.	A, B, E, I (highest hazard group)
2.	R-1
3.	B-3, B-4, H
4.	B-1, B-2
5.	R-3, M (lowest hazard group)

Chapter 6
HISTORIC STRUCTURES

Purpose

Sec. 601. It is the intent of this chapter to provide means for the preservation of historic buildings.

General

Sec. 602. Historic buildings and structures shall meet the minimum standards specified in this chapter.

EXCEPTION: Compliance alternatives approved by the building official may be permitted. The following criteria shall be met:

1. Conformance with the general intent of this code.

2. Compliance with the minimum standards required by Chapter 4 and the specific occupancy requirements of this code.

3. Conformance with the requirements of Chapter 5 where a change of occupancy occurs, except as modified in this chapter.

4. That all unsafe and substandard conditions described in this code are corrected.

5. That the restored building or structure shall be no more hazardous, based on life safety, fire safety and sanitation, than the building was before renovation.

Repairs

Sec. 603. Repairs to any portion of a historic building or structure may be made with original materials and original methods of construction, subject to provisions of this chapter.

Relocated Buildings

Sec. 604. Foundations of relocated historic buildings and structures shall comply with the Building Code. Relocated historic buildings shall otherwise be considered a historic building for the purposes of this code. Relocated historic buildings and structures shall be so sited that exterior wall and opening requirements comply with the Building Code or the compliance alternatives of this code.

Fire Safety

Sec. 605. (a) **General.** Every historic building which does not conform to the construction requirements specified in this code for the occupancy or use and which constitutes a distinct fire hazard as defined herein shall be provided with an approved automatic fire-extinguishing system as determined appropriate by the building official. However, an automatic fire-extinguishing system shall not be used to substitute for, or act as an alternate to, the required number of exits from any facility.

(b) **Exits.** Existing door openings and corridor and stairway widths of less than that specified elsewhere in this code may be approved, provided that in the opinion of the building official there is sufficient width and height for a person to pass through the opening or traverse the exit.

When approved by the building official, the front or main exit doors need not swing in the direction of exit travel, provided other approved exits having sufficient capacity to serve the total occupant load are provided.

(c) **Fire Resistive Requirements.** One-hour fire-resistive construction

throughout need not be required regardless of construction or occupancy.

(d) **Transoms.** Existing transoms may be maintained if fixed in the closed position. Fixed wired glass set in a steel frame shall be installed on one side of the transom.

Special Change of Occupancy Provisions

Sec. 606. Historic structures undergoing a change of occupancy shall comply with Chapter 5. Historic structures may comply with the following alternatives:

1. Where finish materials are required to have a flame-spread classification of Class III or better, existing nonconforming materials shall be surfaced with an approved fire-retardant paint or finish.
2. Regardless of occupancy group, roof covering materials not less than Class C shall be permitted where a fire-retardant roof covering is required. Non-rated materials may be acceptable only where approved by the building official.

Guardrails

Sec. 607. (a) **Height.** Existing guardrails shall comply with the requirements of Section 405 (b).

(b) **Guardrail Openings.** The spacing between existing intermediate railings or openings in existing ornamental patterns shall be accepted. Missing elements or members of a guardrail may be replaced in a manner which will preserve the historic appearance of the building or structure.

Chapter 7
REQUIREMENTS FOR GROUP R OCCUPANCIES

Minimum Standards for All Residential Buildings

Sec. 701. (a) **Fire Warning Systems.** Every dwelling unit and every guest room in a hotel or lodging house used for sleeping purposes shall be provided with smoke detectors in conformance with U.B.C. Standard No. 43-6. Smoke detectors shall be located as specified in the Building Code.

(b) **Exits.** Every dwelling unit or guest room shall have access directly to the outside or to a public corridor or exit balcony. All buildings or portions thereof shall be provided with exits, exitways and appurtenances as required by Chapter 4 of this code

(c) **Light and Ventilation.** All guest rooms, dormitories and habitable rooms within a dwelling unit shall be provided with natural light by means of exterior glazed openings. Such openings shall be openable to permit the flow of natural ventilation, or spaces shall be equipped with mechanical ventilation. Where mechanical ventilation is used, it shall meet the requirements of the Building Code.

(d) **Heating.** Dwelling units and guest rooms shall be provided with heating facilities capable of maintaining a room temperature of 70°F. at a point 3 feet above the floor in all habitable rooms.

(e) **Sanitation.** Every dwelling unit and every lodging house shall be provided with a bathroom with a water closet.

(f) **Plumbing.** All plumbing fixtures shall be connected to a sanitary sewer or to an approved private sewage disposal system. All plumbing fixtures shall be connected to an approved system of water supply and provided with hot and cold running water necessary for its normal operation. All plumbing fixtures shall be of an approved glazed earthenware type or of a similarly nonabsorbent material.

(g) **Room Separations.** Every water closet, bathtub or shower shall be installed in a room which will afford privacy to the occupant.

Change of Occupancy

Sec. 702. Buildings that are changed into a Group R Occupancy shall meet all the requirements specified in the Building Code for that occupancy group. Buildings meeting the requirements of Chapter 5 of this code shall be accepted.

1985 NFPA, All Rights Reserved

NFPA *101*®

Code for Safety to Life

from Fire in Buildings and Structures

1985 Edition

This code establishes the minimum requirements for a reasonable degree of safety from fire in buildings. Residential occupancies are addressed in chapters 16 through 22, and new residences are covered as well as new and existing dormitories and apartments.

Because the specific fire safety requirements vary according to occupancy, it is not practical to attempt a summary of the code regulations. Assistance in interpretation of NFPA 101 is available through the use of the Life Safety Code Handbook, 3rd edition, also published by NFPA.

Many multifamily housing configurations require automatic sprinkler systems. In recent years, residential sprinkler systems have become practical means of life and property protection for one- and two-family dwellings, lodges, and rooming houses. Because several state and local building codes are now requiring residential sprinkler systems for new construction, consideration should be given to their use in new NPS housing. (See NFPA 13 and 13D for specific standards for sprinkler systems.)

LOSS CONTROL

MANAGEMENT PROGRAM

GUIDELINE

NPS - 50

The National Park Service has adopted the following as guidelines for safety in buildings in NPS-50, "Loss Control Management Program":

a. National Fire Protection Association Codes including NFPA 101: Life Safety Code

b. The National Park Service Fire Safety Equivalency System

c. Applicable OSHA standards

USE OF HISTORIC STRUCTURES FOR HOUSING

Many parks contain historic structures that may be suitable for employee housing. Some of these structures were built as housing; others could be adaptively used as housing. Historic buildings may be used for park housing when such use is compatible with preservation and management objectives.

Facility development is subject to section 110 of the National Historic Preservation Act, which states that available historic properties will be used to the maximum extent feasible prior to acquiring, constructing, or leasing other buildings. However, a historic building in a park will not be used for housing unless the need for housing is demonstrated in the park housing management plan.

SECTION 106 COMPLIANCE PROCEDURES

A series of procedures have been created to ensure that all NPS actions and treatments of historic properties conform to the requirements of the law. The primary law concerning management of cultural resources is the National Historic Preservation Act (NHPA), particularly section 106. The regulation for implementation of section 106 is 36 CFR 800. Any action affecting a historic structure is subject to review through the compliance procedure outlined in 36 CFR 800.

Historic structures subject to the compliance procedure are defined as properties that are eligible for or listed on the National Register of Historic Places. Historic structures may be significant for local, state, or national associations; they may be significant individually or for their contribution to a historic district. All historic structures, regardless of their context of significance, are to be administered equally under the compliance provisions.

Assessment of Effect on Cultural Resources (XXX Form)

The XXX form assesses a project's effect on the cultural resources. It is the initial document required for any undertaking potentially affecting cultural resources.

The form may be prepared at the park, regional office, or center where the undertaking originates and provides information on the affected historic property, the proposed undertaking, the effect on the historic property, and measures planned to avoid or mitigate adverse effects. The form also provides information on approved planning documents and previous associated compliance actions. The cultural resource specialists in the appropriate regional office receive the form first, and they determine the necessary actions to ensure compliance with section 106 of

the NHPA. A copy of the form is included at the end of this chapter.

Review and Certification

The regional cultural resource specialists conduct independent reviews of the proposed undertaking, based on documentation from the originating official. In so doing, they exercise professional judgement as to whether

- the documentation of effect is adequate;
- the proposed action is planned and will be conducted in accordance with all relevant management policies and standards;
- the proposal incorporates all feasible measures to minimize adverse effects to cultural resources; and
- the proposed action is within the scope of a programmatic memorandum of agreement.

If the regional cultural resource specialists certify affirmatively to all four conditions, the proposed action satisfies 36 CFR 800 and the regional director authorizes it to proceed. If the concerned regional specialists certify affirmatively to the first three conditions but not to the fourth, the procedures for determination of effect and consultation in 36 CFR 800 must be completed before the action may proceed. Primary parties involved in consultation are the state historic preservation officer and the Advisory Council on Historic Preservation.

Programmatic Memorandum of Agreement

In 1979, to expedite compliance procedures, the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers executed a programmatic memorandum of agreement (PMOA) for preservation maintenance and energy management. The PMOA stipulates that such actions are to be made and carried out in consultation with historical architects or other pertinent preservation professionals and are to conform to the definitions and standards contained in NPS-28, "Cultural Resources Management Guidelines" and in the NPS "Management Policies." The PMOA also directed the Park Service to maintain credence of this compliance in a form acceptable to the Advisory Council and available for review. In 1981 the PMOA was amended, but the basic requirements remained the same. Additional PMOAs may be developed to facilitate review of other types of group actions.

POLICIES AND GUIDELINES

The National Park Service has adopted a number of internal policies and guidelines to facilitate implementation of preservation law.

Policies pertaining to cultural resources management are contained primarily in chapter VI of the NPS "Management Policies." These policies define the various types of cultural resources, procedures for inventorying, classifying, and registering such resources, and the various levels of treatment to be accorded to the different types of resources. Policies have been established regarding the use, alteration, and protection of cultural resources. The "Management Policies" are continually updated to reflect current NPS objectives regarding the management of cultural resources.

NPS-28, including the technical supplement, determines how NPS policy objectives regarding cultural resources are to be implemented. These guidelines deal with a wide range of issues concerning the ongoing management of cultural resources, including research, planning, and treatment.

Although preservation of historic buildings materials and character is a primary consideration in the use and modification of historic structures, it is not the only consideration. Safety, security, handicap accessibility, pest control, and energy conservation are also concerns that must be addressed. NPS policy regarding resolution of these issues in historic structures is summarized below.

Safety

When the use of the subject structures appears to cause safety problems, and the solution to these problems is an apparent conflict with either historical or structural integrity, the use of the structure must then be altered or modified to eliminate the conflict.

Safety goals can many times be achieved by modifying the function of the structure slightly. Modifications will be acceptable only if the following conditions are met:

Such modifications are the only viable solutions.

There will be no physical damage to the structure.

Modifications will cause no unacceptable visual or audio intrusions on the historic scene.

Modifications will have no effect on the qualities that qualify the structure for the National Register.

Any proposed modifications for safety reasons shall be submitted to the regional office, Division of Cultural Resources, for 106 compliance review using the XXX form. Submittal and review of all proposals is required prior to implementation.

Life safety issues are defined in NPS-50 and applicable building codes. Egress is one of the major concerns in historic buildings. Interior functions may vary from one structure to another, but in any case emergency egress will be properly maintained. Random inspections will be conducted by NPS staff and lessees/concessioners to identify potential safety concerns. Deficiencies are to be corrected immediately.

Security

When security problems result because of a certain use and solutions to these problems conflict with the physical or historical integrity of the structures, then the use of the structure shall be modified to mitigate or eliminate the conflict.

Security systems must be justified on the basis of cost-effectiveness and the lack of conflict with physical or historical integrity of the structures.

Any proposed action that has an effect on the structures must be reviewed prior to implementation by the regional office, Division of Cultural Resources. The XXX form must be filled out so that the required 106 review procedures can be initiated.

Handicap Accessibility

Laws and regulations require that all federal programs or activities not discriminate against the handicapped. With respect to historic structures used for housing, accessibility means that when public housing areas are viewed in their entirety, they are accessible to handicapped persons.

Maximum efforts shall be made to provide access to sites and structures without making alterations or structural changes that will have an adverse impact on historic fabric or scene. When alterations or changes cannot be done without impacting the values of the historic scene or structures, accommodation by administrative or program means should be considered. These methods may include, but are not limited to, delivering programs or activities in an alternative accessible location and constructing a new structure or rehabilitating an existing structure for use by the handicapped.

Any proposed handicap accessibility projects shall be reviewed by regional cultural resource specialists prior to implementation. The XXX form should be filled out with the appropriate region to initiate this process.

Pest Control

Any undesirable plant or animal may be considered a pest. Pests may be undesirable because they are dangerous or--as is often the case with

historic structures--because they cause damage to the building. Wood-boring insects, woodpeckers, mice, spiders, ivy, and mildew are common pests that often need to be controlled around historic structures.

NPS policy is to control pests with a minimum use of chemicals; however, it may be necessary to use herbicides or pesticides if effective alternatives are not available or acceptable. In such cases, all federal laws and regulations apply. In no case shall a park use pesticides or herbicides without the concurrence of the regional and Washington offices.

To ensure that alternatives are considered in pest control, the Park Service has initiated a procedure called integrated pest management (IPM). When a particular pest problem arises, the first step in IPM is to accurately identify the pest, if need be with the assistance of a local specialist. Alternative control measures should then be carefully evaluated along with the benefits and risks of each potential remedy. Methods that cause the least amount of harm to the resource and environment and that will do the job should be chosen. Concurrence is then sought from regional and Washington offices.

Form 10-21 is the form for approval of any pesticide project proposals. All parks should have current guidelines and instructions for making pesticide proposals and completing the approval form. If not, contact regional operations for assistance. The XXX form must also accompany form 10-21 for the review of regional cultural resource specialists.

Energy Conservation

The law requires that federal agencies reduce energy consumption. These measures shall be undertaken with historic structures only when it is possible to make these alterations or changes without an adverse effect to the historic scene or fabric. All proposed energy reduction projects shall be reviewed by the regional cultural resources specialists by submitting an XXX form to the regional office.

Storage

"Flammables" should never be stored in or adjacent to historic structures. Provision for storing any such material must be made elsewhere.

Adequate storage for preservation maintenance materials must be anticipated and planned for. Lessees and concessioners should be aware of storage limitations (both content type and load restriction) and plan operations accordingly.

STANDARDS

Of particular relevance to housing design and rehabilitation are the standards contained in chapter 3 of NPS-28. The standards for general treatment and use, preservation, and rehabilitation are as follows:

General Treatment and Use

Every reasonable effort shall be made to provide an adaptive and compatible use for a historic structure that requires minimal alteration of the structure and its environment, or to use a historic structure for one or more of its historically intended purposes. Adaptive use of prehistoric structures is prohibited.

The use of each structure shall be regulated to minimize both immediate and long-range damage to the structure, its environment, and its historic contents.

The distinguishing qualities or character of a structure and its environment shall not be destroyed. The removal or alteration of any significant material or distinctive architectural features should be avoided when possible.

All structures shall be recognized as products of their own time. Alterations that have no historical basis are prohibited.

Changes that have taken place in the course of time are evidence of the history and development of a structure and its environment. These changes may have acquired significance in their own right, and this significance should be recognized and respected.

Distinctive architectural features or examples of skilled craftsmanship that characterize a structure shall be treated with sensitivity.

Deteriorated architectural features shall be repaired rather than replaced, wherever possible. In the event replacement is necessary, the new material should match the material being replaced in composition, design, color, texture, and other visual qualities. Repair or replacement of missing architectural features shall be based on accurate duplications of features substantiated by archeological, historic, physical, or pictorial evidence rather than on conjectural designs or the availability of different architectural elements from other structures.

New or replacement fabric shall be identified, documented, or permanently marked in an unobtrusive manner to distinguish it from original fabric. The manner of identification and location of marks shall be recorded in park files and the historic structure preservation guide.

The surface cleaning of structures shall be undertaken with the gentlest means possible. Cleaning methods that will damage the structure materials or accelerate deterioration are prohibited.

All treatment work that may affect surface or subsurface archeological resources shall be evaluated by an archeologist. Conversely, all proposed ground-disturbing activity, including archeological work near a structure, shall be evaluated by a historical architect to assess possible impacts on the structure.

When it is desirable to save examples of architectural elements removed from a structure, these elements shall be accessioned and cataloged into the national catalog system, providing that they fall within the park's scope of collection statement (see "Management Policies," ch. V, p. 11).

Preservation

Preservation shall maintain the existing form, integrity, and materials of a structure. Substantial reconstruction, restoration of lost features, or removal of accretions are not included in a preservation undertaking.

Preservation includes techniques of arresting or retarding deterioration through a program of ongoing maintenance.

Use of destructive techniques, such as archeological excavation, shall be limited to providing sufficient information for preservation.

Rehabilitation

Contemporary design for alterations and additions to historic structures shall not be discouraged when such alterations and additions do not destroy significant historic, architectural, or cultural material and such design is compatible with the size, scale, color, material, and character of the structure, neighborhood, or environment.

Whenever possible, new additions or alterations to historic structures shall be done in such a manner that if such additions or alterations were removed in the future, the essential form and integrity of the structure would be unimpaired.

DEFINITIONS

Terms Related to Resources

Cultural Resources -- historic and prehistoric sites, structures, districts, and objects associated with or representative of earlier people, cultures, and human activities and events. They also include the primary data for interpretation and understanding of these entities.

Historic District -- a geographically definable area, urban or rural, possessing a significant concentration, linkage, or continuity of historic sites, structures, or objects, unified by past events or aesthetically by plan or physical developments or by similarity of human use. A district also may be composed of individual elements that are separated geographically but are linked by association of history. Historical units of the national park system are usually historic districts in themselves.

Historic Scene -- the overall appearance of all cultural resources and their surroundings as they were in the historic period. It is both the environment in which a historic place reposes and the appearance of that historic place in its environment. To the extent that modern development, exotic or altered vegetation, and topographic changes have intruded upon the environment of a historic place or that the cultural resources themselves have visibly changed, the historic scene has been altered.

Historic Site -- a distinguishable place of ground or area upon which occurred some historic events, persons, or cultures, or which was subjected to sustained human activity. Examples of historic sites (apart from other types of cultural resources they may encompass) are battlefields, trains, middens, farmlands, or places occupied by structures now gone.

Historic Structure -- a relatively large work of humans, consciously created to serve some form of human activity. It is usually immovable by nature or design. Examples are buildings of various kinds, dams, roads, railroad tracks, canals, millraces, bridges, tunnels, automobiles, locomotives, ships, stockades, forts and associated earthworks, Indian mounds, ruins, fences, gardens, and monumental statuary.

Historic Landmark -- a site, structure, or object of national significance. The 1935 Historic Sites Act authorized the National Park Service to survey the nation for sites, buildings, or objects of national significance and to record and carry out necessary research on them. All national historic landmarks are entered on the National Register of Historic Places.

Terms Related to Treatments

Adaptive Use -- the use or process of adapting a structure to a use other than that for which it was designed.

Preservation -- the application of measures to sustain the existing terrains and vegetative cover of a site and the existing form, integrity, and material of an object or structure. It includes initial stabilization work, where necessary, as well as ongoing maintenance.

Preservation Maintenance -- the act or process of applying preservation treatment to a cultural resource. It includes housekeeping, routine and

cyclic work scheduled to mitigate wear and deterioration without altering the appearance of the resource; repair or replacement-in-kind of broken or worn-out elements, parts, or surfaces to keep the existing appearance and function of the structure; and emergency work necessary to protect damaged historic fabric from additional damage.

Housekeeping -- that portion of maintenance that removes undesirable or harmful deposits of soil from the surface of building elements. The goal of historic structure housekeeping is to remove soil in a manner that does the least amount of harm to the surface treated. Housekeeping is repeated at short time intervals so that soil removal can be done with the gentlest and least radical methods. This work is performed on at least an annual basis or more often.

Routine Maintenance -- that portion of maintenance that consists mostly of service activities such as cleaning, tightening, adjusting, oiling, etc., as opposed to cyclic maintenance, which usually involves replacement of fabric. Routine maintenance is generally funded from the park's operating base. This work is performed on at least an annual basis or more often.

Cyclic Maintenance -- that portion of maintenance that usually involves replacement of fabric. Cyclic maintenance is funded from the regional cyclic preservation program.

Terms Related to Reports

Historic Structure Preservation Guide (HSPG) -- directs preservation maintenance activities on specific historic and prehistoric structures once the structures are in a maintainable condition. It serves as a reference for programming, continued housekeeping, and routine and cyclic preservation maintenance for park maintenance personnel. Tailored to the needs of historic or prehistoric structures, the document provides necessary information for orderly, timely, and proper inspection and maintenance.

In addition, the HSPG provides a way to evaluate maintenance activities, determine their strengths and weaknesses, and adopt appropriate corrective measures. Any proposed action not covered by the HSPG that affects the fabric, the historic appearance of structures, or the archeological integrity of structures or associated sites must be submitted to the regional office for professional evaluation and certification. An HSPG has three basic sections: instructions, schedules, and reference materials.

Historic Structure Report (HSR) -- is prepared whenever there is to be a major intervention into historic structures or where activities are programmed that affect the qualities and characteristics that make the properties eligible for inclusion in the National Register. The report

consists of the collection, presentation, and evaluation of anthropological/ archeological, historical, architectural/engineering research findings on historic or prehistoric structures and their setting and makes recommendations for treatment consistent with their significance, integrity, condition, and programmed use. It analyzes and records all periods of construction (not just "significant" periods), modifications, source materials, building techniques, other evidence of use, and setting. Each document includes an administrative section, a physical history and analysis section, and appendixes.

The National Environmental Policy Act of 1969 (NEPA) requires consideration of the environmental effects of proposed federal actions. The entire range of NEPA compliance is covered in NPS-12, which fully describes all applicable laws, regulations, policies, and procedures, including those of direct interest to the Park Service, as specified in the Department of the Interior Manual, part 516 (516-DM).

In general, the need for NEPA compliance must be considered whenever the Park Service proposes an action. Such actions must be analyzed to determine the need for and the type of compliance required. The proposed action may be subject to categorical exclusions, such as replacement housing, or the action may have already been adequately evaluated without further required NEPA compliance.

REPLACEMENT HOUSING

Replacement housing is categorically excluded from NEPA compliance under 516 DM2 appendix 1.7 as "routine and continuing government business, including such things as supervision, maintenance, and replacement activities having limited context and intensity; e.g., limited size and magnitude or short-term effects." There is also a list of exceptions in 516 DM2 appendix 2. If any of these exceptions apply, a NEPA document (usually an environmental assessment) needs to be prepared.

CONSTRUCTION INVOLVING NEW SITES

A NEPA document must be prepared for new sites, unless the site was identified in a previous planning document such as a general management plan (GMP) or development concept plan (DCP). If it was included, a NEPA document is not necessary. If the site has changed slightly, the project would be categorically excluded from NEPA compliance under 516 DM2 appendix 7.4.8(1) when changes or amendments to an approved plan would cause no or only minimal environmental impact.

Existing or approved plans (GMPs, DCPs, and action or implementing plans) contain information necessary for understanding compliance needs commonly include the following natural resource information:

the 100- and 500-year floodplain boundaries, coastal high-hazard zones, and possible flash flood areas

wetlands in the park

prime or unique agricultural lands

threatened or endangered plant and animal species that may be in the park and their critical habitat

state standards for air, water, or noise where the GMP affects these areas of environmental quality

state stream classifications

locations of designated marine sanctuaries affecting or affected by the decisions of the GMP

a description of the conformity of the GMP decisions with approved state coastal zone management plans

This checklist provides some of the more important variables to be evaluated under compliance needs. A designer must also become knowledgeable about landscape values and site character. A checklist for each category of information has been provided in the "Site Design" chapter for similar use--to remind designers, if needed, but especially for nondesign people that also have responsibilities in the NPS housing program.

CHECKLIST

The basic requirement for one- and two-family housing, apartments, and dorms is that at least five percent (5%) of the total but at least one unit (on a housing-area-by-housing-area basis) of all new housing constructed will be designed and built to be either accessible or readily and easily modifiable to be accessible.

For many parks, adaptable housing (rather than permanently dedicated accessible units) provides a more practical option. However, these parks must have an implementation plan that will ensure the modifications necessary to adapt units for use by the handicapped can be accomplished on a high priority basis when needed.

Whenever rehabilitation of existing housing units alters elements, spaces, essential features, or common areas, each such altered aspect shall consider the modifications necessary to help accomplish the accessibility requirements for the entire housing area.

Specific requirements for federally funded or federally leased dwelling units are listed in sections 4.1 and 4.34 of the Uniform Federal Accessibility Standards. Pertinent sections have been included in this guideline for ready reference; for thorough interpretation of the minimum requirements, consult the complete UFAS publication.

Uniform Federal Accessibility Standards

GENERAL SERVICES ADMINISTRATION

DEPARTMENT OF DEFENSE

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

U.S. POSTAL SERVICE

TABLE OF CONTENTS

UNIFORM FEDERAL ACCESSIBILITY STANDARDS

INTRODUCTION 1

1. PURPOSE 2

2. GENERAL 2
2.1 Authority 2
2.2 Provisions for Adults 2

3. MISCELLANEOUS INSTRUCTIONS AND DEFINITIONS 2
3.1 Graphic Conventions 2
3.2 Dimensional Tolerances 2
3.3 Notes 2
3.4 General Terminology 2
3.5 Definitions 3

4. ACCESSIBLE ELEMENTS AND SPACES: SCOPE AND TECHNICAL REQUIREMENTS 4

4.1 Minimum Requirements 4
4.1.1 Accessible Sites and Exterior Facilities: New Construction 4
4.1.2 Accessible Buildings: New Construction 5
4.1.3 Accessible Housing 7
4.1.4 Occupancy Classifications 7
4.1.5 Accessible Buildings: Additions 11
4.1.6 Accessible Buildings: Alterations 12
4.1.7 Accessible Buildings: Historic Preservation 13

4.2 Space Allowances and Reach Ranges 14
4.3 Accessible Route 15
4.4 Protruding Objects 20
4.5 Ground and Floor Surfaces 22
4.6 Parking and Passenger Loading Zones 23
4.7 Curb Ramps 24
4.8 Ramps 25
4.9 Stairs 27
4.10 Elevators 30
4.11 Platform Lifts 33
4.12 Windows 33
4.13 Doors 33
4.14 Entrances 36
4.15 Drinking Fountains and Water Coolers 36
4.16 Water Closets 37
4.17 Toilet Stalls 38
4.18 Urinals 40
4.19 Lavatories and Mirrors 40
4.20 Bathtubs 40
4.21 Shower Stalls 42
4.22 Toilet Rooms 43
4.23 Bathrooms, Bathing Facilities, and Shower Rooms 44
4.24 Sinks 44
4.25 Storage 44

UNIFORM FEDERAL ACCESSIBILITY STANDARDS

4.26 Handrails, Grab Bars, Tub and Shower Seats 45
4.27 Controls and Operating Mechanisms 45
4.28 Alarms 45
4.29 Tactile Warnings 46
4.30 Signage 47
4.31 Telephones 47
4.32 Seating, Tables, and Work Surfaces 48
4.33 Assembly Areas 49
4.34 Dwelling Units 49

5. RESTAURANTS AND CAFETERIAS 57

6. HEALTH CARE 57

7. MERCANTILE 57

8. LIBRARIES 58

9. POSTAL FACILITIES 58

APPENDIX 60

ARCHITECTURAL BARRIERS ACT OF 1968 AS AMENDED 69

INDEX 70

ACCESSIBLE ELEMENTS AND SPACES: SCOPE AND TECHNICAL REQUIREMENTS.

4.1 Minimum Requirements.

4.1.1 Accessible Sites and Exterior Facilities: *New Construction.* An accessible site shall meet the following minimum requirements:

(1) At least one accessible route complying with 4.3 shall be provided *within the boundary of the site* from public transportation stops, accessible parking spaces, passenger loading zones if provided, and public streets or sidewalks to an accessible building entrance.

(2) At least one accessible route complying with 4.3 shall connect accessible buildings, facilities, elements, and spaces that are on the same site.

(3) All objects that protrude from surfaces or posts into circulation paths shall comply with 4.4.

(4) Ground surfaces along accessible routes and in accessible spaces shall comply with 4.5.

(5) (a) *If parking spaces are provided for employees or visitors, or both, then accessible spaces, complying with 4.6, shall be provided in each such parking area in conformance with the following table:*

Total Parking in Lot	*Required Minimum Number of Accessible Spaces*
1 to 25	*1*
26 to 50	*2*
51 to 75	*3*
76 to 100	*4*
101 to 150	*5*
151 to 200	*6*
201 to 300	*7*
301 to 400	*8*
401 to 500	*9*
501 to 1000	*
1001 and over	**

* *2 percent of total.*
** *20 plus 1 for each 100 over 1000.*

EXCEPTION: The total number of accessible parking spaces may be distributed among parking lots, if greater accessibility is achieved.

EXCEPTION: This does not apply to parking provided for official government vehicles owned or leased by the government and used exclusively for government purposes.

(b) *If passenger loading zones are provided, then at least one passenger loading zone shall comply with 4.6.5.*

(c) *Parking spaces for side lift vans are accessible parking spaces and may be used to meet the requirements of this paragraph.*

(d) *Parking spaces at accessible housing complying with 4.6 shall be provided in accordance with the following:*

(i) Where parking is provided for all residents, one accessible parking space shall be provided for each accessible dwelling unit; and

(ii) Where parking is provided for only a portion of the residents, an accessible parking space shall be provided on request of the occupant of an accessible dwelling unit;

(iii) Where parking is provided for visitors, 2 percent of the spaces, or at least one, shall be accessible.

(e) *Parking spaces at health care facilities complying with 4.6 shall be provided in accordance with the following:*

(i) General health care facilities, employee and visitor parking: Comply with Table 4.1.1(5)(a);

(ii) Outpatient facilities: 10 percent of the total number of parking spaces provided;

(iii) Spinal cord injury facilities, employee and visitor parking: 20 percent of total parking spaces provided.

(6) *If toilet facilities are provided on a site, then each such public or common use toilet facility shall comply with 4.22. If bathing facilities are provided on a site, then each such public or common use bathing facility shall comply with 4.23.*

EXCEPTION: These provisions are not mandatory for single user portable toilet or bathing units clustered at a single location; however, at least one toilet unit complying with 4.22 or one bathing unit complying with 4.23 should be installed at each location whenever standard units are provided.

(7) All signs shall comply with 4.30. *Elements and spaces of accessible facilities which shall be identified by the International Symbol of Accessibility are:*

(a) Parking spaces designated as reserved for physically handicapped people;
(b) passenger loading zones;
(c) accessible entrances;
(d) accessible toilet and bathing facilities.

4.1.2 Accessible Buildings: *New Construction.* Accessible buildings and facilities shall meet the following minimum requirements:

(1) At least one accessible route complying with 4.3 shall connect accessible building or facility entrances with all accessible spaces and elements within the building or facility.

(2) All objects that overhang circulation paths shall comply with 4.4.

(3) Ground and floor surfaces along accessible routes and in accessible rooms and spaces shall comply with 4.5.

(4) Stairs connecting levels that are not connected by an elevator shall comply with 4.9.

(5) *One passenger elevator complying with 4.10 shall serve each level in all multi-story buildings and facilities. If more than one elevator is provided, each elevator shall comply with 4.10.*

EXCEPTION: Elevator pits, elevator penthouses, mechanical rooms, piping or equipment catwalks are excepted from this requirement.

EXCEPTION: Accessible ramps complying with 4.8 or, if no other alternative is feasible, accessible platform lifts complying with 4.11 may be used in lieu of an elevator.

(6) Windows. *(Reserved).*

(7) Doors:

(a) *At each accessible entrance to a building or facility, at least one door shall comply with 4.13.*

(b) *Within a building or facility, at least one door at each accessible space shall comply with 4.13.*

(c) *Each door that is an element of an accessible route shall comply with 4.13.*

(d) *Each door required by 4.3.10, Egress, shall comply with 4.13.*

EXCEPTION: In multiple-story buildings and facilities where at-grade egress from each floor is impossible, either of the following is permitted: the provision within each story of approved fire and smoke partitions that create horizontal exits, or, the provision within each floor of areas of refuge approved by agencies having authority for safety.

(8) *At least one principal entrance at each grade floor level to a building or facility shall comply with 4.14, Entrances. When a building or facility has entrances which normally serve any of the following functions: transportation facilities, passenger loading zones, accessible parking facilities, taxi stands, public streets and sidewalks, or accessible interior vertical access, then at least one of the entrances serving each such function shall comply with 4.14, Entrances. Because entrances also serve as emergency exits, whose proximity to all parts of buildings and facilities is essential, it is preferable that all or most exits be accessible.*

(9) *If drinking fountains or water coolers are provided, approximately 50 percent of those provided on each floor shall comply with 4.15 and shall be on an accessible route. If only one drinking fountain or water cooler is provided on any floor, it shall comply with 4.15.*

(10) If toilet facilities are provided, *then each public and common use* toilet room shall comply with 4.22. *Other toilet rooms shall be adaptable.* If bathing facilities are provided, *then each public and common use* bathroom shall comply with 4.23. *Accessible toilet rooms and bathing facilities shall be on an accessible route.*

(11) If storage facilities such as cabinets, shelves, closets, and drawers are provided in accessible spaces, *at least one of each type provided shall contain storage space complying with 4.25. Additional storage may be provided outside of the dimensions shown in Fig. 38.*

(12) Controls and operating mechanisms in accessible spaces, along accessible routes, or as parts of accessible elements (for example, light switches and dispenser controls) shall comply with 4.27.

(13) *If emergency warning systems are provided, then they shall include both audible alarms complying with 4.28.2 and visual alarms complying with 4.28.3. In facilities with sleeping accommodations, the sleeping accommodations shall have an alarm system complying with 4.28.4. Emergency warning systems in health care facilities may be modified to suit standard health care alarm design practice.*

(14) Tactile warnings shall be provided at hazardous conditions as specified in *4.29.3.*

(15) If signs are provided, they shall comply with 4.30. *In addition, permanent signage that identifies rooms and spaces shall also comply with 4.30.4 and 4.30.6.*

EXCEPTION: The provisions of 4.30.4 are not mandatory for temporary information on room and space signage, such as current occupant's name, provided the permanent room or space identification complies with 4.30.4.

(16) Public telephones:

(a) If public telephones are provided, *then accessible public telephones shall comply with 4.31, Telephones, and the following table:*

Number of public telephones provided on each floor:	*Number of telephones required to be accessible:**
1 or more single unit installations	*1 per floor*
*1 bank***	*1 per floor*
*2 or more banks***	*1 per bank. Accessible unit may be installed as a single unit in proximity (either visible or with signage) to the bank. At least one public telephone per floor shall meet the requirements for a forward reach telephone.****

**Additional public telephones may be installed at any height. Unless otherwise specified, accessible telephones may be either forward or side reach telephones.*

***A bank consists of two or more adjacent public telephones, often installed as a unit.*

****EXCEPTION: For exterior installations only, if dial tone first service is not available, then a side reach telephone may be installed instead of the required forward reach telephone (i.e., one telephone in proximity to each bank shall comply with 4.31).*

(b) At least one of the public telephones complying with 4.31, Telephones, shall be equipped with a volume control. The installation of additional volume controls is encouraged, and these may be installed on any public telephone provided.

(17) If *fixed or built-in* seating, tables, or work surfaces are provided in accessible spaces, *at least 5 percent,* but always at least one, of seating spaces, tables, or work surfaces shall comply with 4.32.

(18) Assembly areas:

(a) If places of assembly are provided, they shall comply with *the following table:*

Capacity of Seating & Assembly Areas	*Number of Required Wheelchair Locations*
50 to 75	*3*
76 to 100	*4*
101 to 150	*5*
151 to 200	*6*
201 to 300	*7*
301 to 400	*8*
401 to 500	*9*
501 to 1,000	*
over 1,000	**

* *2 percent of total.*
** *20 plus 1 for each 100 over 1,000.*

(b) *Assembly areas with audio-amplification systems shall have a listening system complying with 4.33 to assist a reasonable number of people, but no fewer than two, with severe hearing loss. For assembly areas without amplification systems and for spaces used primarily as meeting and conference rooms, a permanently installed or portable listening system shall be provided. If portable systems are used for conference or meeting rooms, the system may serve more than one room.*

4.1.3 Accessible Housing. Accessible housing shall comply with the requirements *of 4.1 and 4.34 except as noted below:*

(1) *Elevators:* *Where provided, elevators shall comply with 4.10. Elevators or other accessible means of vertical movement are not required in residential facilities when:*

(a) *No accessible dwelling units are located above or below the accessible grade level; and*

(b) *At least one of each type of common area and amenity provided for use of residents and visitors is available at the accessible grade level.*

(2) *Entrances:* *Entrances complying with 4.14 shall be provided as necessary to achieve access to and egress from buildings and facilities.*

EXCEPTION: In projects consisting of one-to-four family dwellings where accessible entrances would be extraordinarily costly due to site conditions or local code restrictions, accessible entrances are required only to those buildings containing accessible dwelling units.

(3) Common Areas: *At least one of each type of common area and amenity in each project shall be accessible and shall be located on an accessible route to any accessible dwelling unit.*

4.1.4 Occupancy Classifications. *Buildings and facilities shall comply with these standards to the extent noted in this section for various occupancy classifications, unless otherwise modified by a special application section. Occupancy classifications, and the facilities covered under each category include, but are not necessarily limited to, the listing which follows:*

(11) Residential. *Residential occupancy includes, among others, the use of a building or structure, or portion thereof, for sleeping accommodations when not classed as an institutional occupancy. Residential occupancies shall comply with the requirements of 4.1 and 4.34 except as follows:*

(a) Residential occupancies where the occupants are primarily transient in nature (less than 30 days) including:

Facilities	*Application*
Hotels *Motels* *Boarding houses*	*5 percent of the total units, or at least one, whichever is greater, and all public use, common use, and areas which may result in employment of physically handicapped persons.*

(b) Residential occupancies in multiple dwellings where the occupants are primarily permanent in nature, including:

Facilities	*Application*
Multifamily housing (Apartment houses):	
Federally assisted	*5 percent of the total, or at least one unit, whichever is greater, in projects of 15 or more dwelling units, or as determined by the appropriate Federal agency following a local needs assessment conducted by local government bodies or states under applicable regulations.*
Federally owned	*5 percent of the total, or at least one unit, whichever is greater.*
Dormitories	*5 percent of the total, or at least one unit, whichever is greater.*

(c) Residential occupancies in one (1) and two (2) family dwellings where the occupancies are primarily permanent in nature and not classified as preceding residential categories or as institutional.

Facilities	*Application*
One and two family dwelling:	
Federally assisted, rental	*5 percent of the total, or at least one unit, whichever is greater, in projects of 15 or more dwelling units, or as determined by the appropriate Federal agency following a local needs assessment conducted by local government bodies or states under applicable regulations.*
Federally assisted, homeownership	*To be determined by home buyer.*
Federally owned	*5 percent of the total, or at least one unit, whichever is greater.*

4.1.6 *Accessible Buildings: Alterations.*

(1) *General.* *Alterations to existing buildings or facilities shall comply with the following:*

(a) *If existing elements, spaces, essential features, or common areas are altered, then each such altered element, space, feature, or area shall comply with the applicable provisions of 4.1.1 to 4.1.4 of 4.1, Minimum Requirements.*

(b) *If power-driven vertical access equipment (e.g., escalator) is planned or installed where none existed previously, or if new stairs (other than stairs installed to meet emergency exit requirements) requiring major structural changes are planned or installed where none existed previously, then a means of accessible vertical access shall be provided that complies with 4.7, Curb Ramps; 4.8, Ramps; 4.10, Elevators; or 4.11, Platform Lifts, except to the extent where it is structurally impracticable in transit facilities.*

(c) *If alterations of single elements, when considered together, amount to an alteration of a space of a building or facility, the entire space shall be made accessible.*

(d) *No alteration of an existing element, space, or area of a building shall impose a requirement for greater accessibility than that which would be required for new construction. For example, if the elevators and stairs in a building are being altered and the elevators are, in turn, being made accessible, then no accessibility modifications are required to the stairs connecting levels connected by the elevator.*

(e) *If the alteration work is limited solely to the electrical, mechanical, or plumbing system and does not involve the alteration of any elements and spaces required to be accessible under these standards, then 4.1.6(3) does not apply.*

(f) *No new accessibility alterations will be required of existing elements or spaces previously constructed or altered in compliance with earlier standards issued pursuant to the Architectural Barriers Act of 1968, as amended.*

(g) *Mechanical rooms and other spaces which normally are not frequented by the public or employees of the building or facility or which by nature of their use are not required by the Architectural Barriers Act to be accessible are excepted from the requirements of 4.1.6.*

(2) *Where a building or facility is vacated and it is totally altered, then it shall be altered to comply with 4.1.1 to 4.1.5 of 4.1, Minimum Requirements, except to the extent where it is structurally impracticable.*

(3) *Where substantial alteration occurs to a building or facility, then each element or space that is altered or added shall comply with the applicable provisions of 4.1.1 to 4.1.4 of 4.1, Minimum Requirements, except to the extent where it is structurally impracticable. The altered building or facility shall contain:*

(a) *At least one accessible route complying with 4.3, Accessible Route, and 4.1.6(a);*

(b) *At least one accessible entrance complying with 4.14, Entrances. If additional entrances are altered then they shall comply with 4.1.6(a); and*

(c) *The following toilet facilities, whichever is greater:*

(i) *At least one toilet facility for each sex in the altered building complying with 4.22, Toilet Rooms, and 4.23, Bathrooms, Bathing Facilities, and Shower Rooms.*

(ii) *At least one toilet facility for each sex on each substantially altered floor, where such facilities are provided, complying with 4.22, Toilet Rooms; and 4.23, Bathrooms, Bathing Facilities, and Shower Rooms.*

(d) *In making the determination as to what constitutes "substantial alteration," the agency issuing standards for the facility shall consider the total cost of all alterations (including but not limited to electrical, mechanical, plumbing, and structural changes) for a building or facility within any twelve (12) month period. For guidance in implementing this provision, an alteration to any building or facility is to be considered substantial if the total cost for this twelve month period amounts to 50 percent or more of the full and fair cash value of the building as defined in 3.5.*

EXCEPTION: If the cost of the elements and spaces required by 4.1.6(3)(a), (b), or (c) exceeds 15 percent of the total cost of all other alterations, then a schedule may be established by the standard-setting and/or funding agency to provide the required improvements within a 5-year period.

EXCEPTION: Consideration shall be given to providing accessible elements and spaces in each altered building or facility complying with:

(i) 4.6, Parking and Passenger Loading Zones,
(ii) 4.15, Drinking Fountains and Water Coolers,
(iii) 4.25, Storage,
(iv) 4.28, Alarms,
(v) 4.31, Telephones,
(vi) 4.32, Seating, Tables, and Work Surfaces,
(vii) 4.33, Assembly Areas.

(4) *Special technical provisions for alterations to existing buildings or facilities:*

(a) *Ramps. Curb ramps and ramps to be constructed on existing sites or in existing buildings or facilities may have slopes and rises as shown in Table 2 if space limitations prohibit the use of a 1:12 slope or less.*

Table 2
Allowable Ramp Dimensions for Construction in Existing Sites, Buildings, and Facilities

	Maximum Rise		Maximum Run	
Slope*	in	mm	ft	m
Steeper than 1:10 but no steeper than 1:8	3	75	2	0.6
Steeper than 1:12 but no steeper than 1:10	6	150	5	1.5

***A slope steeper than 1:8 not allowed.**

(b) *Stairs. Full extension of stair handrails shall not be required in alterations where such extensions would be hazardous or impossible due to plan configuration.*

(c) *Elevators.*

(i) *If a safety door edge is provided in existing automatic elevators, then the automatic door reopening devices may be omitted (see 4.10.6).*

(ii) *Where existing shaft or structural elements prohibit strict compliance with 4.10.9, then the minimum floor area dimensions may be reduced by the minimum amount necessary, but in no case shall they be less than 48 in by 48 in (1220 mm by 1220 mm).*

(d) *Doors.*

(i) *Where existing elements prohibit strict compliance with the clearance requirements of 4.13.5, a projection of 5/8 in (16 mm) maximum will be permitted for the latch side door stop.*

(ii) *If existing thresholds measure 3/4 in (19 mm) high or less, and are beveled or modified to provide a beveled edge on each side, then they may be retained.*

(e) *Toilet rooms. Where alterations to existing facilities make strict compliance with 4.22 and 4.23 structurally impracticable, the addition of one "unisex" toilet per floor containing one water closet complying with 4.16 and one lavatory complying with 4.19, located adjacent to existing toilet facilities, will be acceptable in lieu of making existing toilet facilities for each sex accessible.*

EXCEPTION: In instances of alteration work where provision of a standard stall (Fig. 30(a)) is structurally impracticable or where plumbing code requirements prevent combining existing stalls to provide space, an alternate stall (Fig. 30(b)) may be provided in lieu of the standard stall.

(f) Assembly areas.

(i) *In alterations where it is structurally impracticable to disperse seating throughout the assembly area, seating may be located in collected areas as structurally feasible. Seating shall adjoin an accessible route that also serves as a means of emergency egress.*

(ii) *In alterations where it is structurally impracticable to alter all performing areas to be on an accessible route, then at least one of each type shall be made accessible.*

(5) Housing. *(Reserved).*

4.1.7 *Accessible Buildings: Historic Preservation.*

(1) ***Applicability.***

(a) *As a general rule, the accessibility provisions of part 4 shall be applied to "qualified" historic buildings and facilities. "Qualified" buildings or facilities are those buildings and facilities that are eligible for listing in the National Register of Historic Places, or such properties designated as historic under a statute of the appropriate state or local government body. Comments of the Advisory Council on Historic Preservation shall be obtained when required by Section 106 of the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 and 36 CFR Part 800, before any alteration to a qualified historic building.*

(b) *The Advisory Council shall determine, on a case-by-case basis, whether provisions required by part 4 for accessible routes (exterior and interior), ramps, entrances, toilets, parking, and displays and signage, would threaten or destroy the historic significance of the building or facility.*

(c) *If the Advisory Council determines that any of the accessibility requirements for features listed in 4.1.7(1) would threaten or destroy the historic significance of a building or facility, then the special application provisions of 4.1.7(2) for that feature may be utilized. The special application provisions listed under 4.1.7(2) may only be utilized following a written determination by the Advisory Council that application of a requirement contained in part 4 would threaten or destroy the historic integrity of a qualified building or facility.*

(2) ***Historic Preservation: Minimum Requirements.***

(a) *At least one accessible route complying with 4.3 from a site access point to an accessible entrance shall be provided.*

EXCEPTION: A ramp with a slope no greater than 1:6 for a run not to exceed 2 ft (610 mm) may be used as part of an accessible route at an entrance.

(d) *Accessible routes from an accessible entrance to all publicly used spaces on at least the level of the accessible entrance shall be provided. Access should be provided to all levels of a building or facility in compliance with 4.1 whenever practical.*

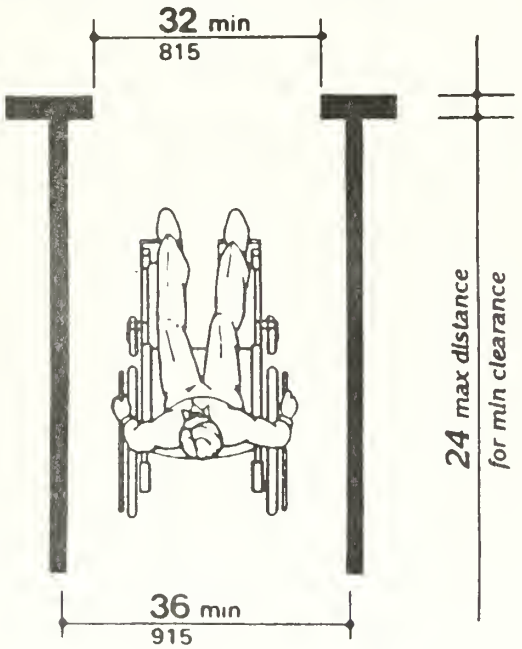


Fig. 1
Minimum Clear Width
for Single Wheelchair

4.34 Dwelling Units.

4.34.1 General. The requirements of 4.34 apply to dwelling units *required to be accessible by 4.1.*

4.34.2* Minimum Requirements. An accessible dwelling unit shall be on an accessible route. An accessible dwelling unit shall have the following accessible elements and spaces as a minimum:

(1) Common spaces and facilities serving individual accessible dwelling units (for example, entry walks, trash disposal facilities, and mail boxes) shall comply with 4.2 through 4.33.

(2) Accessible spaces shall have maneuvering space complying with 4.2.2 and 4.2.3 and surfaces complying with 4.5.

(3) At least one accessible route complying with 4.3 shall connect the accessible entrances with all accessible spaces and elements within the dwelling units.

(4) *See 4.1.1(5)(d) — Parking.*

(5) *Removed and reserved.*

(6) Doors to and in accessible spaces that are intended for passage shall comply with 4.13, *except that the provisions of 4.13.9 apply only to the doors at accessible entrances to the unit itself.*

(7) At least one accessible entrance to the dwelling unit shall comply with 4.14.

(8) Storage in accessible spaces in dwelling units, including cabinets, shelves, closets, and drawers, shall comply with 4.25.

(9) All controls in accessible spaces shall comply with 4.27. Those portions of heating, ventilating, and airconditioning equipment requiring regular, periodic maintenance and adjustment by the resident of a dwelling shall be accessible to people in wheelchairs. If air distribution registers must be placed in or close to ceilings for proper air circulation, this specification shall not apply to the registers.

(10) Emergency alarms *as required by 4.1 and* complying with 4.28.4 shall be provided in the dwelling unit.

(11) *Removed and reserved.*

(12) At least one full bathroom shall comply with 4.34.5. A full bathroom shall include a water closet, a lavatory, and a bathtub or a shower.

(13) The kitchen shall comply with 4.34.6.

(14) If laundry facilities are provided, they shall comply with 4.34.7.

(15) The following spaces shall be accessible and shall be on an accessible route:

(a) The living area.

(b) The dining area.

(c) The sleeping area, or the bedroom in one bedroom dwelling units, or at least two bedrooms or sleeping spaces in dwelling units with two or more bedrooms.

(d) Patios, terraces, balconies, carports, and garages, if provided with the dwelling unit.

4.34.3 Adaptability. The specifications for 4.34.5 and 4.34.6 *include* the concept of adaptability. *Accessible dwelling units may be designed for either permanent accessibility or adaptability.*

4.34.4 Consumer Information. To ensure that the existence of adaptable features will be known to the owner or occupant of a dwelling, the following consumer information shall be provided in each *adaptable* dwelling unit available for *occupancy:*

(1) Notification of the alternate heights available for the kitchen counter and sink, and the existence of removable cabinets and bases, if provided, under counters, sinks, and lavatories.

(2) Notification of the provisions for the installation of grab bars at toilets, bathtubs, and showers.

(3) Notification that the dwelling unit is equipped to have a visual emergency alarm installed.

(4) Identification of the location where information and instructions are available for changing the height of counters, removing cabinets and bases, installing a visual emergency alarm system, and installing grab bars.

(5) Notification that the dwelling unit has been designed in accordance with this *Uniform Federal Accessibility Standards.*

In addition, the *parties who will be responsible for making adaptations* shall be provided with the following information:

(1) Instructions for adjusting or replacing kitchen counter and sink heights and for removing cabinets.

(2) A scale drawing showing methods and locations for the installation of grab bars.

(3) A scale drawing showing the location of adjustable or replaceable counter areas and removable cabinets.

(4) Identification of the location of any equipment and parts required for adjusting or replacing counter tops, cabinets, and sinks.

(5) Instructions for installing a visual emergency alarm system, if the dwelling unit is equipped for such an installation.

4.34.5* Bathrooms. *Accessible or* adaptable bathrooms shall be on an accessible route and shall comply with the requirements of 4.34.5.

4.34.5.1 Doors. Doors shall not swing into the clear floor space required for any fixture.

4.34.5.2 Water Closets.

(1) Clear floor space at the water closet shall be as shown in Fig. 47(a). The water closet may be located with the clear area at either the right or left side of the toilet.

(2) The height of the water closet shall be at least 15 in (380 mm), *and no more than 19 in (485 mm),* measured to the top of the toilet seat.

(3) Structural reinforcement or other provisions that will allow installation of grab bars shall be provided in the locations shown in Fig. 47(b). If provided, grab bars shall be installed as shown in Fig. 29 and shall comply with 4.26.

(4) The toilet paper dispenser shall be installed within reach as shown in Fig. 47(b).

4.34.5.3 Lavatory, Mirrors, and Medicine Cabinets.

(1) The lavatory and mirrors shall comply with 4.22.6.

(2) If a cabinet is provided under the lavatory in adaptable bathrooms, then it shall be removable to provide the clearances specified in 4.22.6.

(3) If a medicine cabinet is provided above the lavatory, then the bottom of the medicine cabinet shall be located with a usable shelf no higher than 44 in (1120 mm) above the floor.

4.34.5.4 Bathtubs. If a bathtub is provided, then it shall have the following features:

(1) Floor space. Clear floor space at bathtubs shall be as shown in Fig. 33.

(2) Seat. An in-tub seat or a seat at the head end of the tub shall be provided as shown in Fig. 33 and 34. The structural strength of seats and their attachments shall comply with 4.26.3. Seats shall be mounted securely and shall not slip during use.

(3) Grab bars. Structural reinforcement or other provisions that will allow installation of grab bars shall be provided in the locations shown in Fig. 48. If provided, grab bars shall be installed as shown in Fig. 34 and shall comply with 4.26.

(4) Controls. Faucets and other controls shall be located as shown in Fig. 34 and shall comply with 4.27.4.

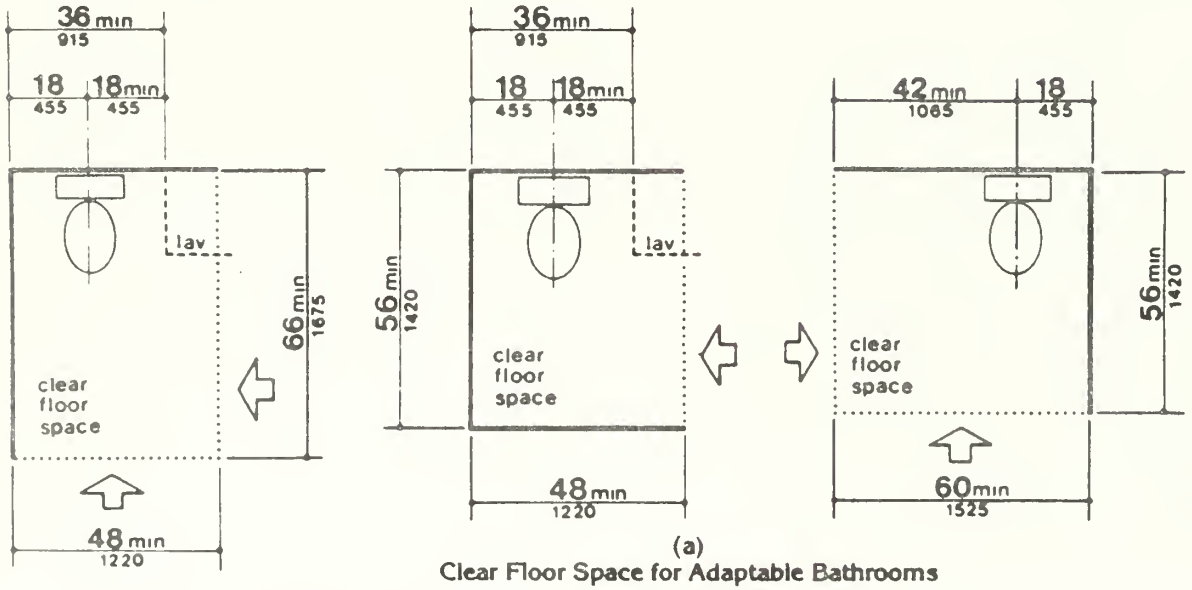
(5) Shower unit. A shower spray unit with a hose at least 60 in (1525 mm) long that can be used as a fixed shower head or as a hand-held shower shall be provided.

4.34.5.5 Showers. If a shower is provided, it shall have the following features:

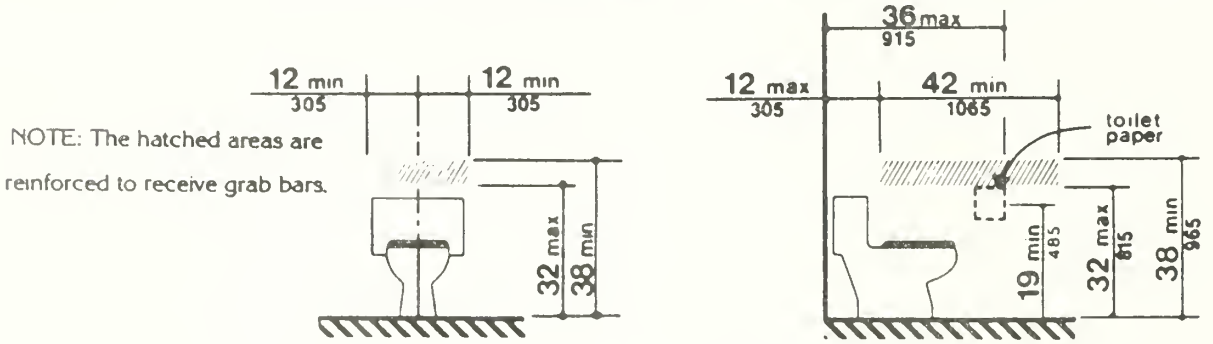
(1) Size and clearances. Shower stall size and clear floor space shall comply with either Fig. 35(a) or (b). The shower stall in Fig. 35(a) shall be 36 in by 36 in (915 mm by 915 mm). The shower stall in Fig. 35(b) will fit into the same space as a standard 60 in (1525 mm) long bathtub.

(2) Seat. A seat shall be provided in the shower stall in Fig. 35(a) as shown in Fig. 36. The seat shall be 17 in to 19 in (430 mm to 485 mm) high measured from the bathroom floor and shall extend the full depth of the stall. The seat shall be on the wall opposite the controls. The structural strength of seats and their attachments shall comply with 4.26.3. Seats shall be mounted securely and shall not slip during use.

(3) Grab bars. Structural reinforcement or other provisions that will allow installation of grab bars shall be provided in the locations shown in Fig. 49. If provided, grab bars shall be installed as shown in Fig. 37 and shall comply with 4.26.

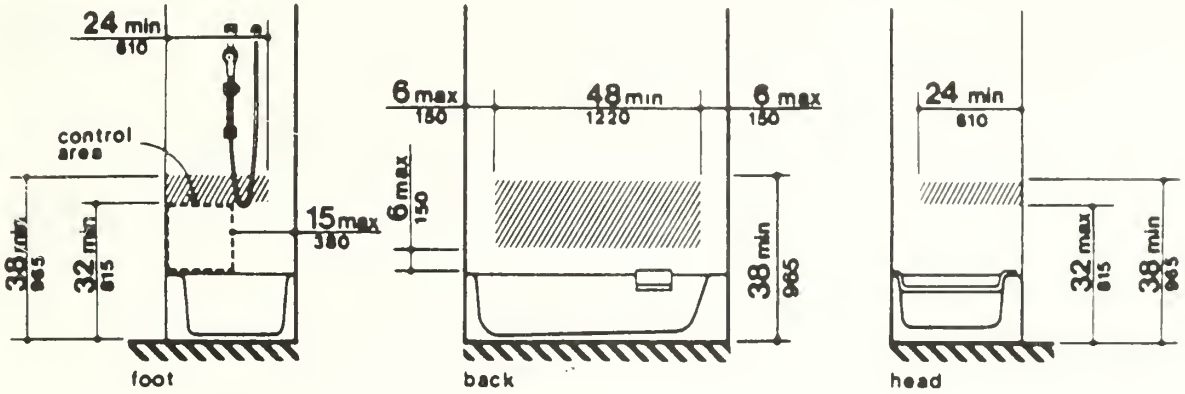


(a)
Clear Floor Space for Adaptable Bathrooms

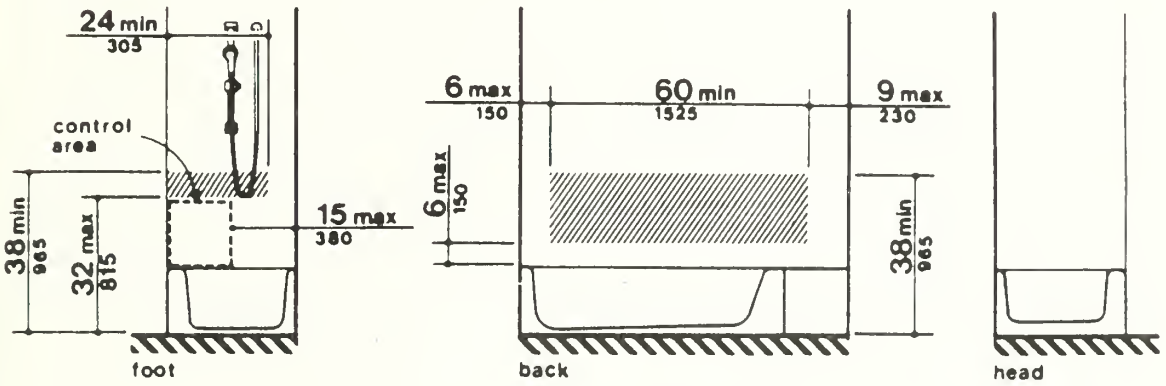


(b)
Reinforced Areas for Installation of Grab Bars

Fig. 47
Water Closets in Adaptable Bathrooms



(a)
With Seat In Tub



(b)
With Seat at Head of Tub

NOTE: The hatched areas are reinforced to receive grab bars.

Fig. 48
Location of Grab Bars and Controls of Adaptable Bathtubs

(4) Controls. Faucets and other controls shall be located as shown in Fig. 37 and shall comply with 4.27.4. In the shower stall in Fig. 35(a), all controls, faucets, and the shower unit shall be mounted on the side wall opposite the seat.

(5) Shower unit. A shower spray unit with a hose at least 60 in (1525 mm) long that can be used as a fixed shower head at various heights or as a hand-held shower shall be provided.

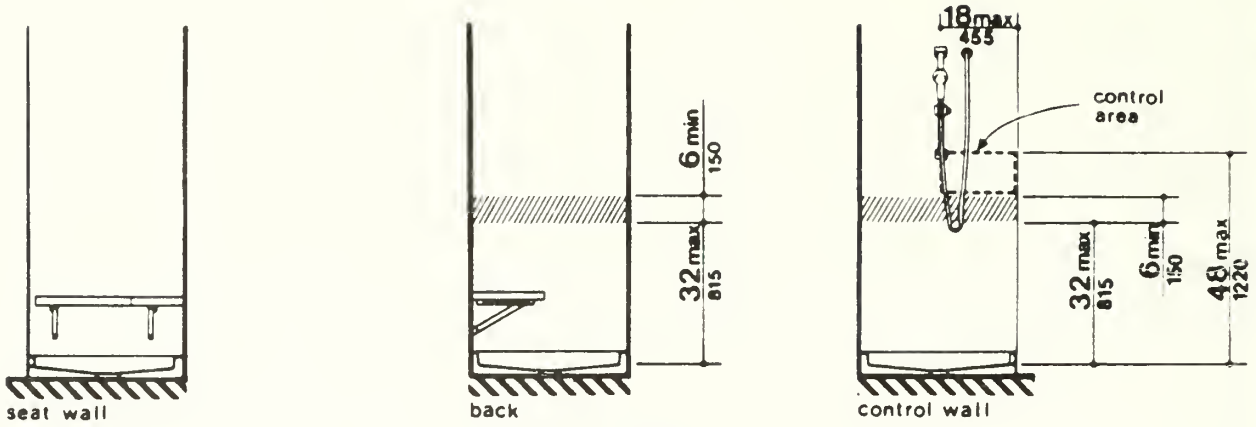
4.34.5.6 Bathtub and Shower Enclosures. Enclosures for bathtubs or shower stalls shall not obstruct controls or transfer from wheelchairs onto shower or bathtub seats. Enclosures on bathtubs shall not have tracks mounted on their rims.

4.34.5.7 Clear Floor Space. Clear floor space at fixtures may overlap.

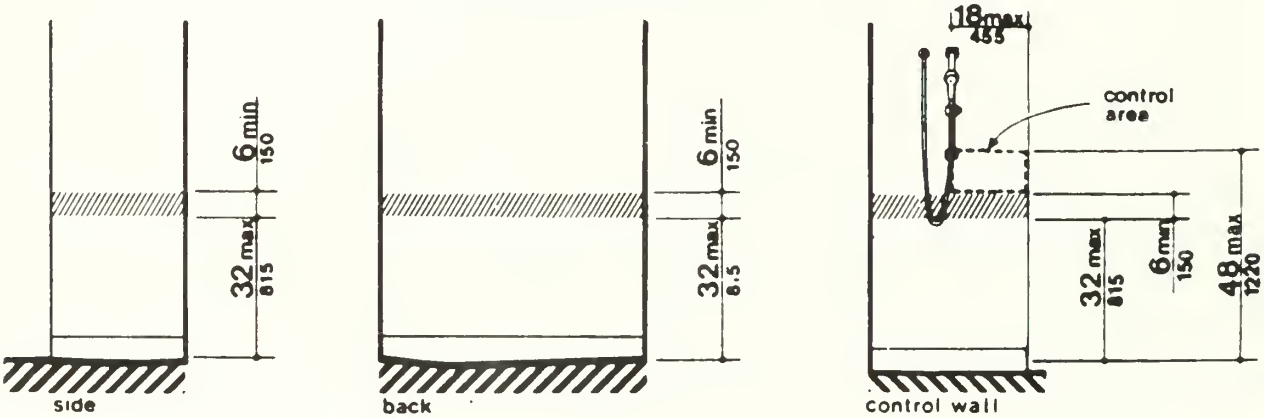
4.34.6 Kitchens. *Accessible or adaptable* kitchens and their components shall be on an accessible route and shall comply with the requirements of 4.34.6.

4.34.6.1* Clearance. Clearances between all opposing base cabinets, counter tops, appliances, or walls shall be 40 in (1015 mm) minimum, except in U-shaped kitchens, where such clearance shall be 60 in (1525 mm) minimum.

4.34.6.2 Clear Floor Space. A clear floor space at least 30 in by 48 in (760 mm by 1220 mm) complying with 4.2.4 that allows either a forward or a parallel approach by a person in a wheelchair shall be provided at all appliances in the kitchen, including the range or cooktop, oven, refrigerator/freezer, dishwasher, and trash compactor. Laundry equipment located in the kitchen shall comply with 4.34.7.



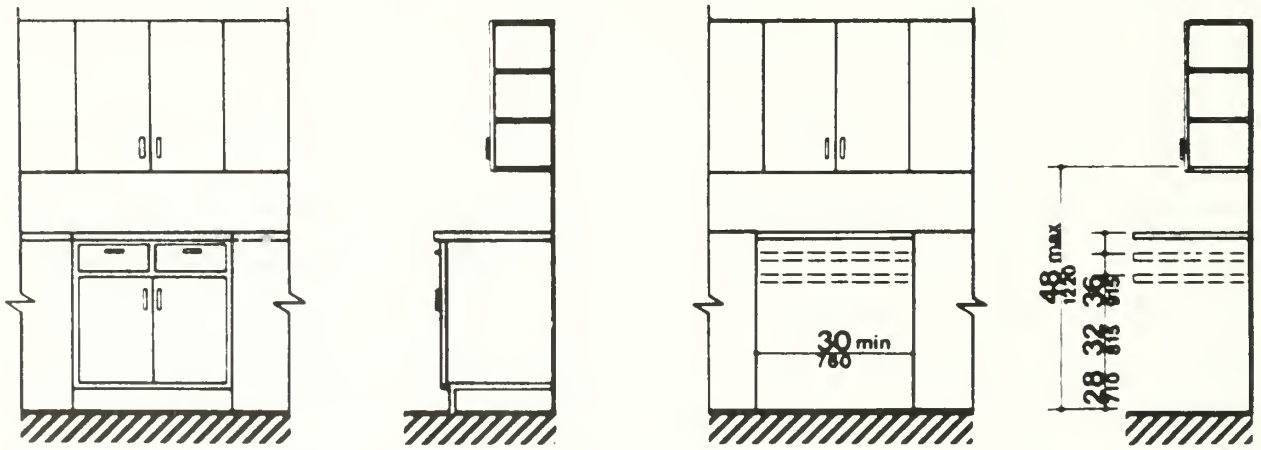
(a)
36-in by 36-in (915-mm by 915-mm) Stall



(b)
30-in by 60-in (750-mm by 1525-mm) Stall

NOTE: The hatched areas are reinforced to receive grab bars.

Fig. 49
Location of Grab Bars and Controls of Adaptable Showers



(a)
Before Removal of Cabinets and Base

(b)
Cabinets and Base Removed and Height Alternatives

Fig. 50
Counter Work Surface

4.34.6.3 Controls. All controls in kitchens shall comply with 4.27.

4.34.6.4 Work Surfaces. At least one 30 in (760 mm) section of counter shall provide a work surface that complies with the following requirements (see Fig. 50):

(1) The counter shall be *mounted at a maximum height of 34 in (865 mm) above the floor, measured from the floor to the top of the counter surface, or shall be* adjustable or replaceable as a unit to provide alternative heights of 28 in, 32 in, and 36 in (710 mm, 815 mm, and 915 mm), measured from the top of the counter surface.

(2) Base cabinets, if provided, shall be removable under the full 30 in (760 mm) minimum frontage of the counter. The finished floor shall extend under the counter to the wall.

(3) Counter thickness and supporting structure shall be 2 in (50 mm) maximum over the required clear area.

(4) A clear floor space 30 in by 48 in (760 mm by 1220 mm) shall allow a forward approach to the counter. Nineteen inches (485 mm) maximum of the clear floor space may extend underneath the counter. The knee space shall have a minimum clear width of 30 in (760 mm) and a minimum clear depth of 19 in (485 mm).

(5) There shall be no sharp or abrasive surfaces under such counters.

4.34.6.5* Sink. The sink and surrounding counter shall comply with the following requirements (see Fig. 51):

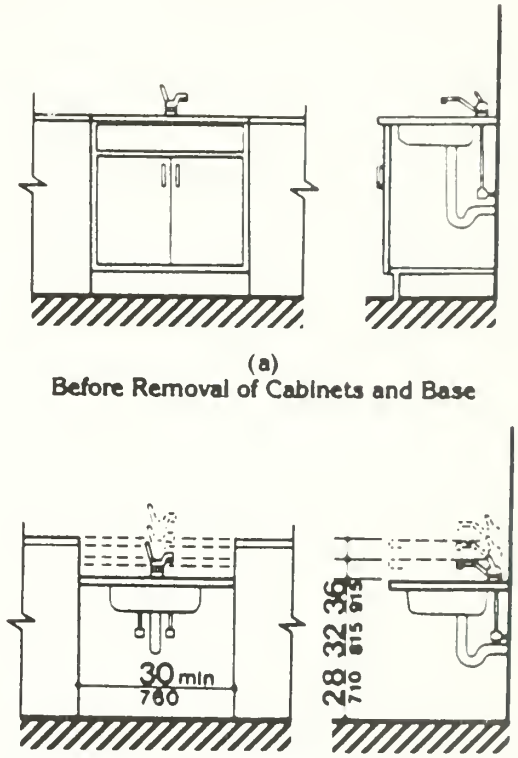
(1) The sink and surrounding counter shall be *mounted at a maximum height of 34 in (865 mm) above the floor, measured from the floor to the top of the counter surface, or shall* be adjustable or replaceable as a unit to provide alternative heights of 28 in, 32 in, and 36 in (710 mm, 815 mm, and 915 mm), measured from the floor to the top of the counter surface or sink rim. The total width of sink and counter area shall be 30 in (760 mm).

(2) Rough-in plumbing shall be located to accept connections of supply and drain pipes for sinks mounted at the height of 28 in (710 mm).

(3) The depth of a sink bowl shall be no greater than 6-1/2 in (165 mm). Only one bowl of double-or triple-bowl sinks needs to meet this requirement.

(4) Faucets shall comply with 4:27.4. Lever-operated or push-type mechanisms are two acceptable designs.

(5) Base cabinets, if provided, shall be removable under the full 30 in (760 mm) minimum frontage of the sink and surrounding counter. The finished flooring shall extend under the counter to the wall.



(a)
Before Removal of Cabinets and Base

(b)
Cabinets and Base Removed and Height Alternatives

Fig. 51
Kitchen Sink

(6) Counter thickness and supporting structure shall be 2 in (50 mm) maximum over the required clear space.

(7) A clear floor space 30 in by 48 in (760 mm by 1220 mm) shall allow forward approach to the sink. Nineteen inches (485 mm) maximum of the clear floor space may extend underneath the sink. The knee space shall have a clear width of 30 in (760 mm) and a clear depth of 19 in (485 mm).

(8) There shall be no sharp or abrasive surfaces under sinks. Hot water and drain pipes under sinks shall be insulated or otherwise covered.

4.34.6.6* Ranges and Cooktops. Ranges and cooktops shall comply with 4.34.6.2 and 4.34.6.3. If ovens or cooktops have knee spaces underneath, then they shall be insulated or otherwise protected on the exposed contact surfaces to prevent burns, abrasions, or electrical shock. The clear floor space may overlap the knee space, if provided, by 19 in (485 mm) maximum. The location of controls for ranges and cook-tops shall not require reaching across burners.

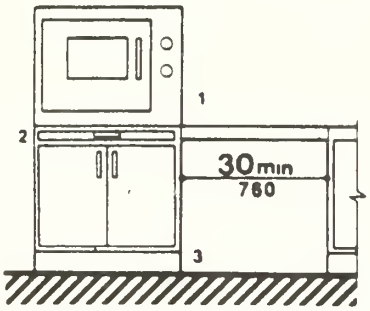
4.34.6.7* Ovens. Ovens shall comply with 4.34.6.2 and 4.34.6.3. Ovens shall be of the self-cleaning type or be located adjacent to an adjustable height counter with knee space below (see Fig. 52). For side-opening ovens, the door latch side shall be next to the open counter space, and there shall be a pull-out shelf under the oven extending the full width of the oven and pulling out not less than 10 in (255 mm) when fully extended. Ovens shall have controls on front panels; they may be located on either side of the door.

4.34.6.8* Refrigerator/Freezers. Refrigerator/freezers shall comply with 4.34.6.3. *Provision shall be made for refrigerators which are:*

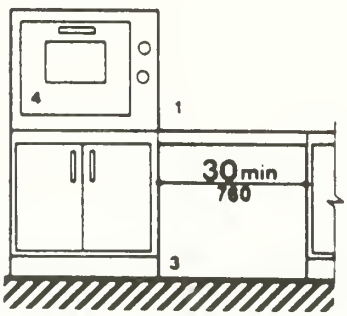
(1) Of the vertical side-by-side refrigerator/freezer type; or

(2) Of the over-and-under type and meet the following requirements:

(a) Have at least 50 percent of the freezer space below 54 in (1370 mm) above the floor.



(a)
Side-Hinged Door



(b)
Bottom-Hinged Door

SYMBOL KEY:
1. Countertop or wall-mounted oven.
2. Pull-out board preferred with side-opening door.
3. Clear open space.
4. Bottom-hinged door.

Fig. 52
Ovens without Self-Cleaning Feature

(b) Have 100 percent of the refrigerator space and controls below 54 in (1370 mm).

Freezers with less than 100 percent of the storage volume within the limits specified in 4.2.5 or 4.2.6 shall be the self-defrosting type.

4.34.6.9 Dishwashers. Dishwashers shall comply with 4.34.6.2 and 4.34.6.3. Dishwashers shall have all rack space accessible from the front of the machine for loading and unloading dishes.

4.34.6.10* Kitchen Storage. Cabinets, drawers, and shelf areas shall comply with 4.25 and shall have the following features:

(1) Maximum height shall be 48 in (1220 mm) for at least one shelf of all cabinets and storage shelves mounted above work counters (see Fig. 50).

(2) Door pulls or handles for wall cabinets shall be mounted as close to the bottom of cabinet doors as possible. Door pulls or handles for base cabinets shall be mounted as close to the top of cabinet doors as possible.

4.34.7 Laundry Facilities. If laundry equipment is provided within individual accessible dwelling units, or if separate laundry facilities serve one or more accessible dwelling units, then they shall meet the requirements of 4.34.7.1 through 4.34.7.3.

4.34.7.1 Location. Laundry facilities and laundry equipment shall be on an accessible route.

4.34.7.2 Washing Machines and Clothes Dryers. Washing machines and clothes dryers in common use laundry rooms shall be front loading.

4.34.7.3 Controls. Laundry equipment shall comply with 4.27.

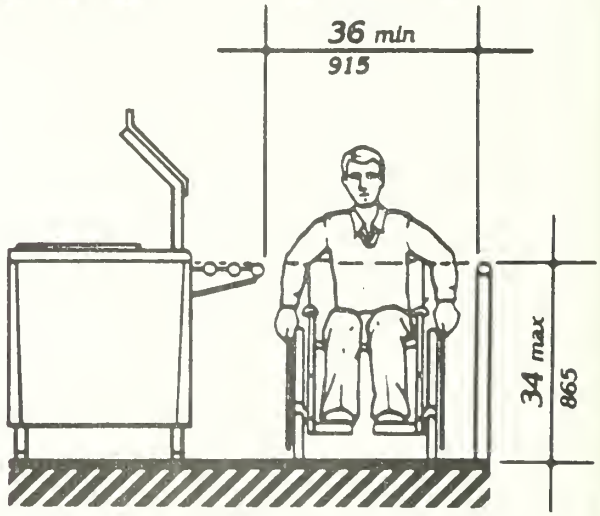


Fig. 53
Food Service Lines

APPENDIX

This appendix contains additional information that should help the designer to understand the minimum requirements of the standard or to design buildings or facilities for greater accessibility. The paragraph numbers correspond to the sections or paragraphs of the standard to which the material relates and are therefore not consecutive (for example, A4.2.1 contains additional information relevant to 4.2.1). Sections for which additional material appears in this appendix have been indicated by an asterisk.

A4.34 Dwelling Units.

A4.34.2 Minimum Requirements. Handicapped people who live in accessible dwelling units of multifamily buildings or housing projects will want to participate in all on-site social activities, including visiting neighbors in their dwelling units. Hence, any circulation paths among all dwelling units and among all on-site facilities should be as accessible as possible. An accessible second exit to dwelling units provides an extra margin of safety in a fire.

A4.34.5 Bathrooms. Although not required by these specifications, it is important to install grab bars at toilets, bathtubs, and showers if it is known that a dwelling unit will be occupied by elderly or severely disabled people.

A4.34.6 Kitchens.

A4.34.6.1 Clearance. The minimum clearances provide satisfactory maneuvering spaces for wheelchairs only if cabinets are removed at the sink.

A4.34.6.5 Sink. Installing a sink with a drain at the rear so that plumbing is as close to the wall as possible can provide additional clear knee space for wheelchair users.

A4.34.6.6 Ranges and Cooktops. Although not required for minimum accessibility, countertop range units in a counter with adjustable heights can be an added convenience for wheelchair users.

A4.34.6.7 Ovens. Countertop or wall-mounted ovens with side-opening doors are easier for people in wheelchairs to use. Clear spaces at least 30 in (760 mm) wide under counters at the side of ovens are an added convenience. The pullout board or fixed shelf under side-opening oven doors provides a resting place for heavy items being moved from the oven to a counter.

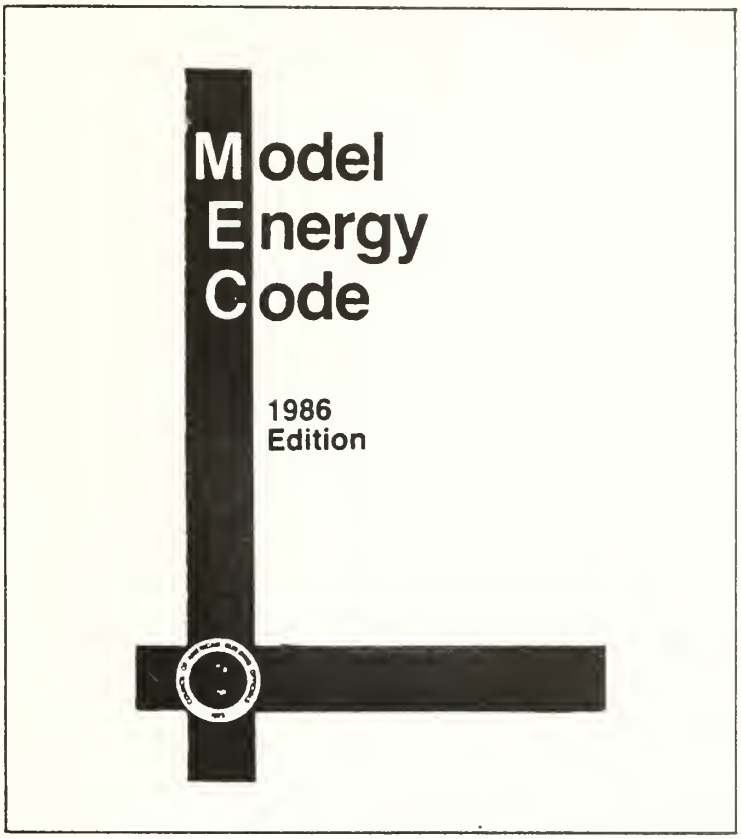
A4.34.6.8 Refrigerator/Freezers. Side-by-side refrigerator/freezers provide the most usable freezer compartments. Locating refrigerators so that their doors can swing back 180 degrees is more convenient for wheelchair users.

A4.34.6.10 Kitchen Storage. Full height cabinets or tall cabinets can be provided rather than cabinets mounted over work counters. Additional storage space located conveniently adjacent to kitchens can be provided to make up for space lost when cabinets under counters are removed.

CHECKLIST

Energy conservation is an important design parameter for all new construction. An important first step in energy-conscious design is to ensure that the building makes sense for its environment--that the design is responsive to regional variations in temperature, humidity, wind, and sun. Guidelines for regional passive energy conservation strategies are included in the Design section, Climatic Design chapter of this guideline. The actual design of building envelopes for adequate thermal resistance and low air leakage, and the design and selection of heating, ventilation, cooling, and illumination systems for energy conservation are governed by state energy codes and federal energy conservation standards. Because most states base their energy codes on the CABO Model Energy Code, NPS residences should be designed to meet or exceed this code. In addition, the Department of Energy has issued Mandatory Energy Conservation Standards for New Federal Residences and an accompanying computer program for developing performance specifications.

The Model Energy Code and the federal energy conservation standards do not apply to historic buildings, but additions to existing structures must comply with the provisions of the code as they relate to new construction. Rehabilitation work on historic and nonhistoric buildings, however, can use the energy code and conservation standards as reference guides.



CABO MODEL ENERGY CODE

1986 edition, as amended
Council of American Building Officials
5203 Leesburg Pike, Suite 708
Falls Church, Virginia 22041

The CABO Model Energy Code is based on American Society of Heating, Refrigerating and AirConditioning Engineers (ASHRAE) standard 90A-1980, Energy Conservation in New Building Design, and incorporates ASHRAE code standards RS-1 through RS-21. The code is structured to permit compliance by any one of three paths of design described as follows:

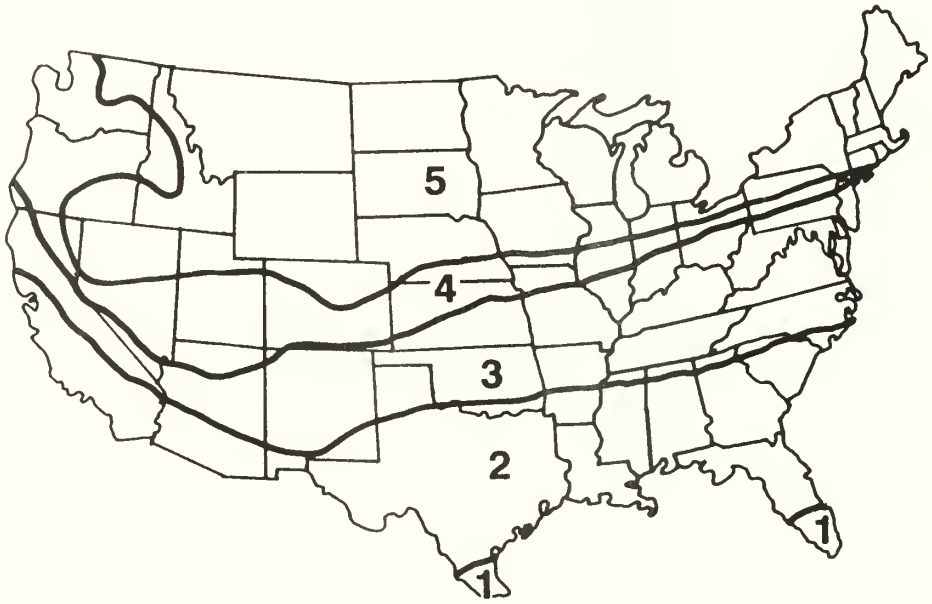
a systems approach for the entire building and its energy-using subsystems, which may utilize nondepletable sources (annual energy consumption for building system is compared to a "standard" building design)

a component performance approach, which evaluates the thermal performance of the roof/ceiling, walls and floors, the air infiltration

rate of doors/windows, and the performance of heating, cooling, ventilation, and illumination systems

a specified accepted practice, which simplifies the evaluation of thermal performance by selection of "standard" wall, roof, and floor assemblies

An example of the R-value requirements of this code and a copy of the table of contents follows:



R-Value Requirements

The zone map above highlights regional minimum R-value requirements necessary to comply with the new CABO Model Energy Code.

Zone	Ceiling R-Value	Wall R-Value	Floor R-Value
1	R-19	R-12	R-11
2	R-30	R-19	R-11
3	R-38	R-19	R-14
4	R-38	R-19	R-22
5	R-49	R-19	R-25

Source: Mineral Insulation Manufacturers Association

R-Value Requirements Based on Heating Degree Days*

Heating Degree Day[1] Zone	Maximum Glazing U-Value	Maximum Glazing Area[2]	Minimum Insulation			
			Wall[3] R-Value	Ceiling R-Value	Floor R-Value	Door R-Value
0- 500	1.10	18%	12	19	11	2
501-1500	1.10	18%	12	30	19	2
	1.10	18%	14	38	14	2
	1.10	18%	16	30	14	2
	1.10	18%	19	30	11	2
	1.10	15%	12	30	11	2
	1.10	12%	12	19	11	2
1501-3000	.58	18%	12	30	19	2
	.58	18%	14	30	14	2
	.58	18%	16	38	11	2
	.58	18%	19	30	11	2
	.65	15%	12	38	14	2
	.65	15%	14	30	14	2
	.65	15%	16	30	11	2
	1.10	12%	16	38	19	2
3000-4000	.58	18%	12	38	19	5
	.58	18%	14	30	19	5
	.58	18%	16	38	14	5
	.58	18%	19	30	14	5
	.65	15%	12	30	19	5
	.65	15%	14	38	14	5
	.65	15%	16	30	14	5
	.65	12%	14	38	11	5
4001-5000	.58	15%	12	30	26	5
	.58	15%	14	38	19	5
	.44	15%	14	30	14	5
	.58	15%	16	30	19	5
	.58	15%	19	38	14	5
	.65	12%	14	30	19	5
	.65	12%	16	38	14	5
	.65	12%	19	30	14	5
5001-6000	.38	15%	14	30	19	5
	.58	15%	16	38	26	5
	.44	15%	16	30	19	5
	.58	15%	19	49	19	5
	.58	15%	19	30	26	5
	.44	12%	14	30	19	5
	.65	12%	16	30	26	5
	.65	12%	19	38	19	5

Heating Degree Day[1] Zone	Maximum Glazing U-Value	Maximum Glazing Area[2]	Minimum Insulation			
			Wall[3] R-Value	Ceiling R-Value	Floor R-Value	Door R-Value
6001-10000	.38	15%	14	38	26	5
	.44	15%	16	38	26	5
	.38	15%	16	49	19	5
	.38	15%	19	30	19	5
	.58	15%	19	49	26	5
	.58	15%	22	38	30	5
	.58	15%	22	49	25	5
	.65	12%	16	49	26	5
	.65	12%	19	38	26	5
	.44	12%	19	30	19	5
	.44	10%	14	38	19	5
	.65	10%	16	38	26	5

1. Heating degree days base is 65°F.

2. Glass area is given as a percent of total wall area. Percentages above the maximum require the use of figures 1, 2, and 6 in the 1988 amendment to the Model Energy Code.

3. Wall R-values given are the total of cavity and sheathing R-values.

* Interpretation of Model Energy Code minimum insulation requirements provided by Mineral Insulation Manufacturers Association (MIMA), 1420 King Street, Alexandria, Virginia 22314.

TABLE OF CONTENTS

CHAPTER		PAGE
1	**ADMINISTRATION AND ENFORCEMENT**	1
	101. Scope and General Requirements	1
	102. Materials and Equipment	2
	103. Alternate Materials—Method of Construction, Design or Insulating Systems	2
	104. Plans and Specifications	3
	105. Inspections	3
	106. Validity	3
2	**DEFINITIONS**	4
	201. General Definitions	4
3	**DESIGN CONDITIONS**	12
	301. Design Criteria	12
	302. Thermal Design Parameters	12
	303. Mechanical Ventilation Criteria	13
4	**BUILDING DESIGN BY SYSTEMS ANALYSIS AND DESIGN OF BUILDINGS UTILIZING NONDEPLETABLE ENERGY SOURCES**	14
	401. Scope	14
	402. Systems Analysis	14
	403. Nondepletable Source Analysis	16
5	**BUILDING DESIGN BY COMPONENT PERFORMANCE APPROACH**	18
	501. Scope	18
	502. Building Envelope Requirements	18
	503. Building Mechanical Systems	24
	504. Service Water Heating	36
	505. Electrical Power and Lighting	39
6	**BUILDING DESIGN BY ACCEPTABLE PRACTICE**	44
	601. Scope	44
	602. Building Envelope Requirements	44
	603. Building Mechanical Systems	45
	604. Service Water Heating	49
	605. Electrical Power and Lighting	50
7	**STANDARDS**	53
	Accredited Authoritative Agencies	54
	FIGURES 1-11	55-65
	APPENDIX	67
	Wall Assemblies	68
	Roof/Ceiling Assemblies	71
	Floor Assemblies	72

Part II

Department of Energy

Office of Conservation and Renewable Energy

10 CFR Part 435

Mandatory Energy Conservation Standards for New Federal Residential Buildings; Notice of Proposed Interim Rule and Public Hearings and Finding of No Significant Impact (FONSI) on Proposed Energy Conservation Standards for New Federal Residential Buildings

MANDATORY ENERGY CONSERVATION STANDARDS FOR NEW FEDERAL RESIDENTIAL BUILDINGS

10 CFR part 435
Department of Energy
Office of Conservation and Renewable Energy

This law requires agencies to establish and comply with an energy consumption goal for the design of new federal residential buildings based on the microcomputer calculation procedure known as COSTSAFR (Conservation Optimization Standard for Savings in Federal Residences). The computer program determines the most effective set of energy conservation measures, selected from among the measures included within the program, that will produce the optimum life-cycle cost for a specific type of residential building in the geographic location where it will be constructed. This most effective set of measures is expressed as a total point score that, in turn, serves as the energy consumption goal for the design of the federal residential building. The computer program produces a compliance point system that is intended to be attached to housing requests for proposals issued by agencies of the federal government. The point system, which is specifically tailored to each request, is to be used by proposers to demonstrate that their specific designs comply with the energy consumption goal. The point system also provides a standard method for each proposer to estimate the energy cost

over the life of the building in discounted dollars. This estimate can then be used by evaluators to estimate the total energy performance of each proposal.

HUDAT members will receive training in the COSTSAFR program as well as user manuals and software. Although intended for new construction, the COSTSAFR program also will allow cost/benefit analyses of energy conservation options for rehabilitation projects.

PARK DESIGN THEMES

In a recent speech entitled "Trends Affecting the National Park System," Denis P. Galvin, Deputy Director, National Park Service, highlighted the importance of comprehensive planning for each national park. Galvin traces the genesis of this tradition to a meeting of the American Society of Landscape Architects (ASLA) in Boston 1916. "James S. Pray of the ASLA and Harvard University," Galvin continued, "advocated the development of comprehensive general plans for every national park and monument."

Galvin goes on to explain that in May 1918 Secretary Franklin T. Lane, in a letter to Stephen Mather who was the first director of the National Park Service, directed that "All improvements will be carried out in accordance with the preconceived plan developed with special reference to the preservation of the landscape . . . ."

Normon T. Newton, author of Design on the Land (page 536), credits Thomas C. Vint, chief NPS landscape architect, with introducing, creating, and maintaining a master plan for each park area. Such plans, coordinated by planning/design professionals, created the ultimate design for the whole area. Master plans or general management plans are the comprehensive instruments to serve the following objectives in terms of a park design theme.

> Arranging for the ultimate management and development of the entire park area and ensuring such plans are done without false motion and waste.
>
> Periodically update plans to treat required changes. Review the purpose for establishment, interpretive objectives, and the administrative program for carrying out the plan.

NPS policies emphasize these points in relation to the design theme.

> Appropriate steps will be taken to achieve proper integration of facilities into the park environment. Additions will be of minimal impact and clearly subordinate to major park features and/or landscape character.
>
> A cohesive design theme will reflect the purpose and character of the park or of an individual developed area of a large park. Standard designs and components may be used, but they will be adapted as appropriate to the specific site and conditions as part of the design process.

Integration of facilities require the use of good professional analysis skills and appropriate practices in the assessment of park values, landscape

character, site character, visual quality, and other relevant resource values. A design properly executed relies heavily on relationships to the site character of the landscape, existing building character, resource and user analyses, sensitivity to all environmental factors, use of the facilities materials, colors, textures, and other forms and the subtleties of native character and ethnic social cultural values, expressions, and group affiliations with the landscape.

The intended purpose of the housing guideline is to provide a framework within which contemporary standards for housing can be met while complementing the plan and character of a park. Every park has a general management plan (GMP) to guide development; more detailed direction for subareas may be provided through development concept plans (DCPs). The park design theme identifies the character of the park with specific recommendations for site modifications and building design.

DESIGN THEME CHARACTERISTICS

The style or cumulative character of physical improvements in a park can be considered its design theme. The theme may be based upon efforts to harmonize with preeminent natural features or inspired by a historic structure that is the focus of a park. In some instances the design tradition of a park has acquired significance in its own right and is not only a precedent but a resource to be protected. Particularly in new parks the design theme may be undefined; in very large, old parks, several apparently contradictory themes may be evident.

The following 16 characteristics may be used to define a park design theme by identifying the unifying or common features within a given park or subarea:

Qualities of park development
- land use relationships
- plant associations and distribution
- street character and layout
- scale and character of site improvements

Qualities of the neighborhood
- rhythm of spaces between buildings
- landscaping and ground cover
- setback and orientation to the street
- enclosures formed by walls, fences, landscapes, and buildings

Qualities of building form
- height-to-width ratio
- average building height
- shape of facade and building massing
- roof shapes

Qualities of building treatment
- material type, color, and surface treatment
- proportion and distribution of facade openings
- directional expression of facade
- architectural details and embellishment

DESIGN CRITERIA FOR INFILL

Once the thematic characteristics of a park or subarea are defined, they may be used to guide infill work in established neighborhoods--particularly historic districts--and new design adjacent to historic structures. Design criteria should only specify those features that are essential to ensure compatibility between new and existing development. Similarly, the features should be more or less definitively based on the uniformity and occurrence of the feature in the neighborhood. For example, if a new unit is to fit into a Mission 66 tract of one-story, brick houses--all set back 25 feet from the street--then those three characteristics may be identified as desirable features for the new unit. If the tract contains one-story, split-level, and two-story units, an appropriate design criteria might be that height would not exceed two stories.

The stronger the character of the area the more stringent the design criteria should be. In areas with less well-defined design themes, design criteria should be less stringent. The primary exception to this rule-of-thumb is that management may choose to strengthen the overall park design theme by giving extra weight to specific features. For example, many different roof forms may have been used over the years in a given developed area, but the design criteria could express preference for a gabled or hipped shape. By giving weight to a single roof form from the existing range of precedent, the design theme of the park will gradually be simplified and clarified as new development takes place.

CONTENTS OF SITE DESIGN CHAPTER

GENERAL SITE CONSIDERATIONS
- Landscape Character
- The Landscape of the Site
  - Select and Analyze the Site
  - Develop Form and Plan
  - Cultural Landscape Considerations
- Native Plants

SITE RESOURCE ANALYSIS
- Physiography
- Geology
- Hydrology
- Soils
- Climate
- Vegetation
- Visual Analysis
- Landscape Functions Analysis

SITE DESIGN PRINCIPLES
- Principles for Grading/Slopes/Excavation
- Principles for Pedestrian Ways--Walks and Steps
- Principles for Bicycle Ways
- Other Site Design Principles

GENERAL SITE CONSIDERATIONS

The site design section has been drafted to be a source to guide design decisions that affect park housing. As an important aspect, which affects the quality of life for park employees and the overall visual quality of the park landscape, site design guidelines can improve two central issues--the quality of park housing and the quality of that housing as related to the overall visual park scene. The need for park housing is fundamental to the management purposes of national parks--to achieve appropriate stewardship and protect the resources. Accordingly, the design and rehabilitation of park housing should express NPS concern for the condition of the landscape, overall design quality, and maintenance of the built environment through appropriate landscape management methods. Park housing should be a statement of NPS philosophy, an extension of what we are all about, our values and our ethical concern for the land.

The goal of these guidelines is to establish site practices and design techniques that both complement and secure cohesive relationships between the land and the functions it serves. For occupants and visitors, the quality of the built environment is a measure of how well we perform our stewardship responsibilities and how well the care of our park landscape and the designed areas for use reflect our capability to demonstrate an ethical love and respect for the most treasured lands of our country.

The guidelines are not meant to replace the services of trained design professionals or to bypass the need to utilize established comprehensive design processes. There should be no replacement for the seasoned and practiced eye of professionals that know what to look for, even if their services are available for only for a short duration.

LANDSCAPE CHARACTER

National park areas are generally places where there is a natural landscape character, an apparent harmony or unity of natural elements, vegetation, terrain features, vegetative associations, and wildlife. Park areas often appeal to the senses and evoke a strong emotional response. People experience a real pleasure in sensing the unity and harmony of a total scene. A harmonious natural landscape character evokes a sense of oneness or wholeness that results in greater pleasure of the quality we call beauty. Beauty has by definition been described as "the evident harmonious relationship of all sensed components."

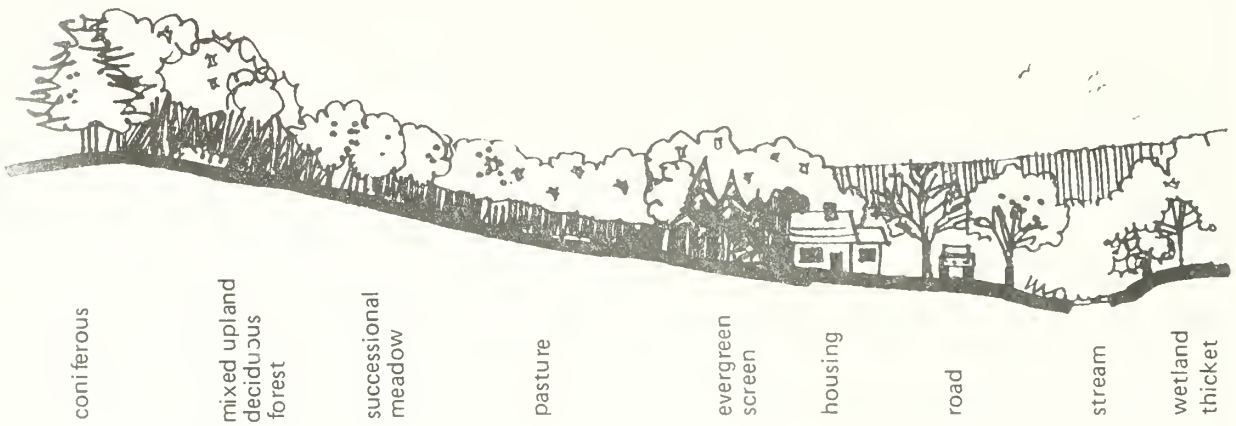
Each park also has common distinguishing visual characteristics that are termed a landscape type, ranging from coastal plains to Alaskan tundra. In planning and design, understanding the natural character is required to achieve an essential measure of harmony with the park land. The ability to comprehend the physical nature of the site and its extensional

environment is the first step. The analysis allows us to assess site suitability, introduce appropriate uses, integrate development modifications with functional efficiency, and make sure it is visually attractive. Incongruous projects would be eliminated as discordant elements. Intrusive design elements, colors, forms, and details are to be eliminated whenever possible.

Each landscape region--seashores, tropics, valleys, forests, hills, mountains, prairies, and deserts--has unique soil, weather, and terrain features that can be generally categorized. Man inhabits many varied areas. A type of structure suited to one area and land type will probably not be suited to another without some modification. For example, in the desert, subsurface structures use the stable temperature of the earth to balance the day/night extremes. In the tropics, above-ground building is desired to allow circulation, minimize heat and humidity, and avoid subsurface water.

THE LANDSCAPE OF THE SITE

These guidelines are layed out as a checklist of items and steps that will allow managers and designers a set of reference points by which they can make informed decisions. The ideas have been derived from appropriate sources, individuals, reviewing previous site selections, functional considerations, and working in aesthetically and environmentally compatible solutions. The guidelines, in summary, provide a set of steps and processes to be considered that, with appropriate analysis technique, will improve on the functionality and appearance of the product.



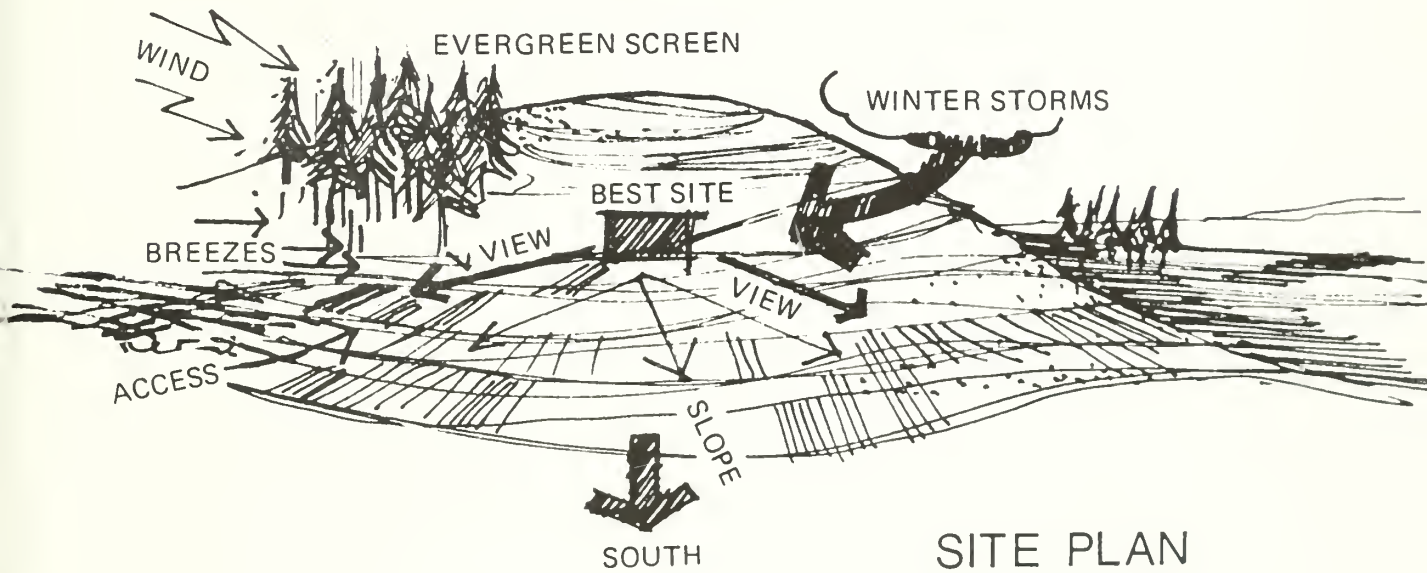
All potential residential sites exist in a context that is part of a larger landscape setting. One example is the variety of plant habitats that exist in different stages. A significant step in the design process is to analyze the site and its surroundings and record existing conditions. The analysis will help the planned landscape become a more natural part of the surrounding environment.

Select and Analyze the Site

Consider all past, present, and future microclimate factors, such as weather patterns, temperature, rainfall, wind, and sunlight. Analyze the landscape, land use, land patterns, views, vegetation, soils, slopes, water supply, architectural styles, and any factor of relevance to making proper site selection.

Other factors to be addressed include utilities, sewage treatment, land status, zoning plans, adjacent uses, circulation patterns, community facilities, regional styles, and utilities.

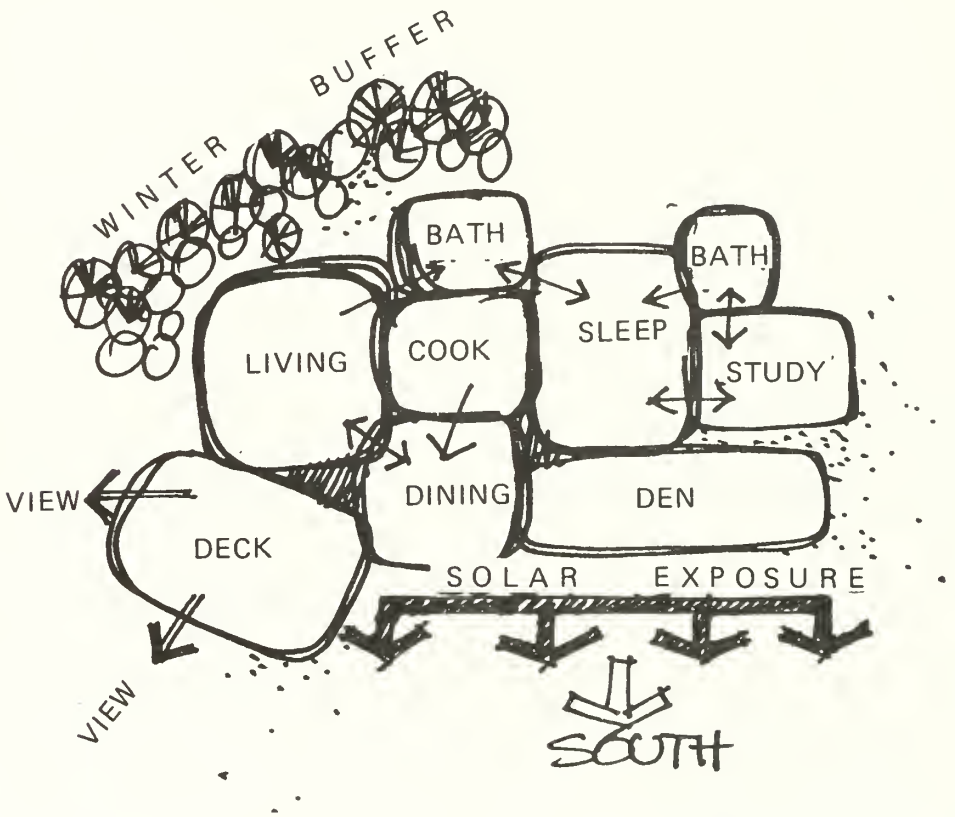
All aspects of the site should be studied utilizing knowledge about the sites related environmental factors. It is wise to prepare alternative analysis to ensure finding the best site possible during the site selection/design analysis process.



SITE PLAN

Develop Form and Plan

The analysis process to assimilate the functional needs of human occupancy, environmental factors, and aesthetics begins with the development of a sketch plan. The bubbles allocate spaces according to the functions, describe and their interrelationships. The effort begins with a loose sketch on a topography sheet.



A passive solar system should be researched by working with architects to plan the system and develop sketch plans.

The interior space, external walls, and site should be developed and integrated in a preliminary plan.

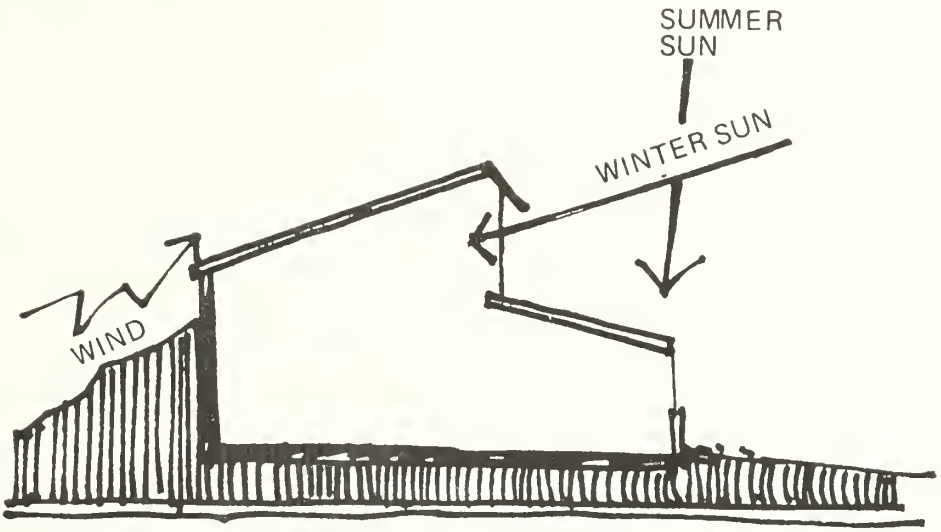
Overlays and sketch plans will help arrange all the requirements into a comprehensive relationship.

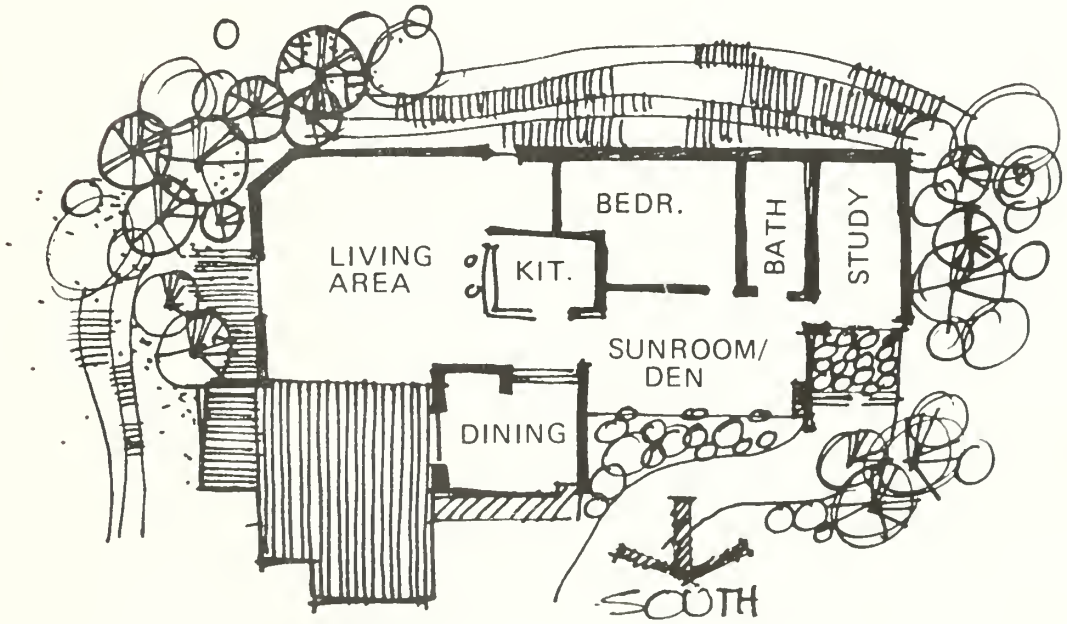
Revise and rearrange the schematic as needed, and develop a plan to scale.

All systems, materials, and elements of the plan should be done simply, tastefully, and with artful integration.

Make final evaluations and adjustments to the plan and specifications.

Always keep an open mind and evaluate alternatives.


SUMMER SUN
WINTER SUN
WIND


BEDR.
BATH
STUDY
LIVING AREA
KIT.
SUNROOM/ DEN
DINING
SOUTH

Cultural Landscape Considerations

Although much National Park Service work is directed to the natural landscapes, attention has also recently been directed to designed historic landscapes and vernacular landscapes. Much technical information is being developed to systematically plan, survey, and evaluate designed historic landscapes, and currently the same type of information is being developed for vernacular landscapes. Recently, a procedure has been developed to document, assess, and nominate, designed historic landscapes to the National Register of Historic Places (see "National Register Bulletin" 18, U.S. Dept. of the Interior, National Park Service). A procedure for documenting, assessing, and nominating vernacular historic landscapes to the National Register of Historic Places is expected to be issued in a companion "National Register Bulletin" issue.

Vernacular landscapes are defined as the work of distinct cultural groups or ethnic communities--e.g., Indian pueblos and Shaker villages. Efforts are still being made to better define and evaluate the vernacular landscapes; in this subchapter, we will mainly discuss the designed historic landscape.

Designed Historic Landscapes. According to "National Register Bulletin" 18, which outlines designed historic landscape documentation, assessment, and issues that apply to the nomination process, the definition provided for designed historic landscapes is that of being

> a landscape that has significance as a design or work of art; was consciously designed and laid out by a master gardner, landscape architect, architect, or horticulturalist to a design principle, or an owner or other amateur using a recognized style or tradition in response or reaction to a recognized style or tradition; has a historical association with a signifacnt person, trend, event, etc. in landscape gardening or landscape architecture; or a significant relationship to the theory or practice of landscape architecture" (p. 2).

Many of the designed historic landscape areas have significance for reasons other than as an expression of design. Central Park is a case in point. It is an outstanding example of landscape architectural design, but with significance also to social history and transportation in New York City. Another aspect of the designed historic landscape is the interrelationship that exists between architecture and landscape. Examples include such landscape types as residential grounds and estates; churchyards and cemeteries; monuments; memorial grounds; plazas and squares; institutional grounds; civic design works; housing subdivisions; plannned communities/resorts; local, state, and national parks; commemorative parks; outdoor recreation facilities; parkways, roads, and trails; and water-oriented recreation design.

If a housing area that is planned for new construction or reconstruction is planned within a designed historic landscape, preservation of the historical integrity and significance is of parmount concern. A set of agreed-upon criteria exist that document the area's significance. The appropriate body of documentation, references, register forms, and procedures influence decisions made with respect to development decisions within the landscape.

Data Variables Checklist for Designed Historic Landscapes. Data variables used to describe features and functions of designed historic landscapes should be described in a written narrative and located on a map or plan. Information collected should include descriptions related to the following landscape-related features that would be valuable to design formulation.

existing topography and grading*
natural features
land uses
circulation system of roads, paths, trails, etc.
spatial relationships and orientations such as symmetry, asymmetry, and axial alignment
views and vistas into and out of the landscape
vegetation by botanical name and common name, with measurements related to plant size
landscape dividers such as walls, fences, and hedges
drainage and engineering structures
site furnishings and small-scale elements such as planters and urns
bodies of water such as pools, fountains, lakes, streams, and cascades
lighting, including actual fixtures, street lights, lanterns, and the use of both natural and artificial lighting as design elements
signs delineating entrances, street names, and other features
buildings such as houses, barns, dormitories, or hospitals that may be contained within the landscape
structures such as bridges, roads, and dams
sculpture and other works of art

*This "checklist" is also taken from "National Register Bulletin" 18, p. 3.

NATIVE PLANTS

Executive Order 11987 (42 FR 25949, 3 CFR May 24, 1987) for exotic organisms states "executive agencies shall to the extent permitted by law, restrict the introduction of exotic species into the ecosystem."

Currently, under section 3 of Executive Order 11987, the secretary of the interior, in consultation with the secretary of agriculture, is charged with developing rules or regulations to implement this order. It is proposed that the National Park Service enter into a memorandum of understanding (MOU) with the Soil Conservation Service (SCS) to utilize their plant materials program and the expertise of their plant materials specialists to develop seed sources native to the park. This program will improve the reclamation and revegetation activities that are needed because of construction, maintenance, and visitor use within park areas.

The joint venture between the Park Service and the Soil Conservation Service will enable us to exchange ideas and utilize the services of 24 plant materials centers maintained by SCS. These centers will eventually lead to improved seed production, revegetation techniques, and techniques in landscape management.

Vegetation Checklist

Vegetative communities associations

region (geographic)
park (plant list)
site (local plant types)
utilize plants native to park as determined by resource management staff

DIGITIZED BY

SITE RESOURCE ANALYSIS

A body of knowledge has come from the collective wisdom of professional planners and designers working with site design. There are basic principles that serve as useful reminders of the many design analysis factors that need to be considered to develop a successful aesthetic and functional relationship of the building to its environment and its occupants.

Site design is developed into a desirable physical layout by the application of design criteria. Below is a list of criteria for determining building types and their location and orientation on a site. These are derived from basic principles of the effects of the environment on buildings and activities. A more detailed discussion of physiography, geology, hydrology, soils, climate, vegetation, visual analysis, landscape functions, and site design considerations follows this summary of basic principles.

The Manual: Design and Control of Land Development in Suburban Communities has a precise description of environmental factors that must be considered for building, siting, and design.

PHYSIOGRAPHY

Physiography deals with the study of the form of the earth's surface, including mountains, valleys, plateaus, and plains. Landforms are the product of different geologic substances and processes. In combination, these materials and processes create different landscape forms and structures. The landform is simply the visual expression of the underlying geology. Landforms have significant implications for site design. The United States has 24 physiographic regions, which are areas of similar physiographic processes, geology, hydrology, and climate.

Physiography Checklist

Analyze landform hazards
- erosion
- steep slopes
- floodplains

Analyze ground surface
- regrading
- degree of slope
- direction of surface drainage

Analyze landform in relation to plant habitat
- elevaton
- windward or leeward side of slope
- direction of slope
- drainage conditions

GEOLOGY

As the science that studies all the materials and processes that form and transform materials that make up the earth, geology is of critical importance to site planning in considering new homesites or for construction of any kind. Geologic hazards, such as faults, slide areas, subsidence, soil tolerance in terms of terrain modification, etc., are but a few of the site limitations that are important to consider.

Geology Checklist

Earthquake zone
- location of faults
- nature of surface deposits
- depth to bedrock
- steepness of slope

Ground subsidence
- natural collapse of subsurface rock formations
- collapse due to events such as pumping
- man-made formations

Coastal or riverbank erosion

Mass movements
- landslides
- mudflows
- rockfalls

Bedrock and surface materials
- ease of excavation
- foundation strength
- depth to bedrock
- depth to water table
- glacial features

Ground water suitability/wells
- depth to water table
- rock porosity and permeability
- pollution potential

HYDROLOGY

Water is a crucial component of site planning. The understanding of water problems is critical to appropriate location of a structure. Water supply, drainage, and the viability of plant species must all be considered. Water is not only essential but also adds immeasurably to the aesthetic appeal of a landscape under normal circumstances.

Hydrologic Suitability Checklist

Floodplains
- define extent
- limit future building
- protect existing structures

Aquifer recharge areas
- protect from pollution or destruction

Construction suitability
- foundations - depth to water table
  surface and subsurface drainage
- wells - depth to water table
  water bearing capacity
  specific yield
  pollution

Terrain modification (grading)
- drainage - subsurface drainage
  surface grades
  grassed waterways
  runoff
- erosion - revegetate graded soils

Vegetative/water suitability
- precipitation amount
- infiltration
- runoff

Septic tanks
- depth to bedrock
- depth to water table
- drainage characteristics of soils

Grading suitability
- depth to bedrock
- slope holding capacity of soils
- erosion or landslide potential

Plant growth suitability
- depth to bedrock
- depth to water table
- temperature variations
- mineral composition of soils

SOILS

As an ecological factor soils deserve the keenest appreciation and management. As a life-giving medium in which plants grow, animals feed, homes are built, roads are constructed, and waste is absorbed, much about life depends on the soil. For home construction, soilbearing capacity, drainage, and surface characteristics have a critical effect on structural integrity, soil stability, and plant growth.

Soils Suitability Checklist

Soils construction suitability/foundations
- soil depth
- soil texture effects
  - bearing capacity
  - erosion
  - drainage
  - slope suitability

Septic tanks

Terrain modification (regrading)
- topsoil protection
- soil depth
- soil texture effects
  - erosion
  - drainage
  - slope suitability

Soil type evaluation
- pH
- porosity
- texture
- structure
- water
- available nutrients

CLIMATE*

Climate has a powerful influence on how we live and methods by which we site our homes. A site design must be responsive to climatic conditions to provide comfort, liveability, energy efficiency, and an aesthetic relationship.

Climatic Factors Affecting Site Conditions Checklist

- solar radiation
- wind
- precipitation
- temperature
- landform
- vegetation
- water
- paving
- structures

VEGETATION

The importance of native plant species to a park's ecosystem resource, integrity, natural stability, vitality, and the nourishment of the landscape and the support of mankind and wildlife communities cannot be overstated. Especially in parks, plants are not mere horticultural adjuncts to be arranged unthinkingly around construction projects. In addition to the above, plants contribute to quality of the site, hold soils, modify climates, provide windbreaks and screens, and define various zones of a park. The following principles are strongly suggested with regard to design relationships with the park's vegetative communities (see following figure).

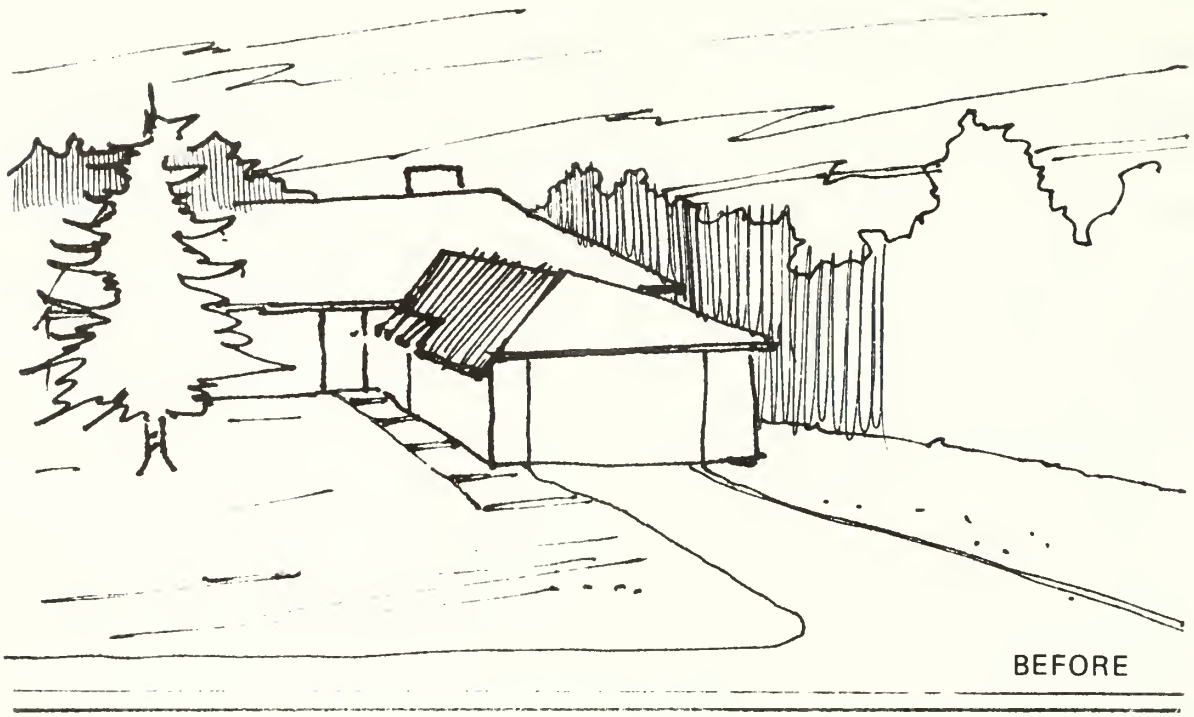
1. Preserve the existing vegetation.

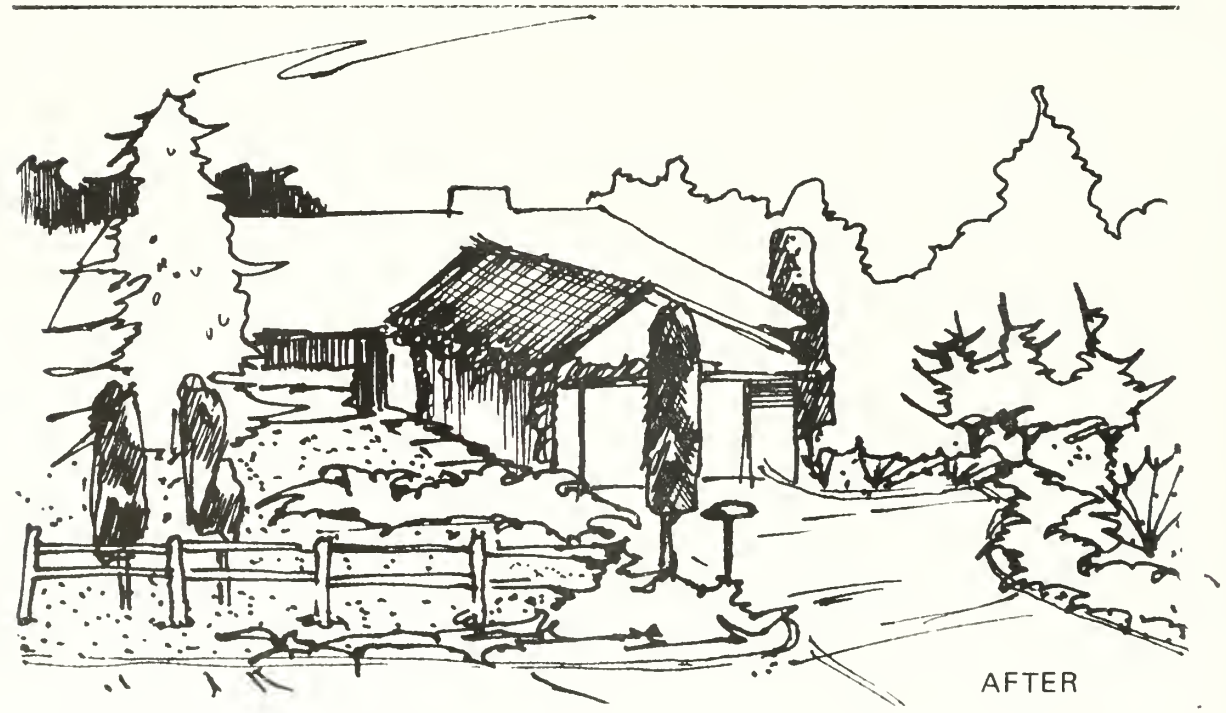
2. Utilize plant stock seed collections from the park's habitat only. Inappropriate plants can alter or destroy a landscape's visual quality and its ecological health.

3. Select each plant to serve its intended function. Design analysis and drawings facilitate the thought processes, usually in the form of a planting plan. Various uses can be made of plants, e.g., screening, shade, energy efficiency, enframement of desirable views, windscreens, and naturalized compositional effects.

---

*Further detailed discussion is contained in this document under the "Climatic Design" chapter.





Among the functional uses of plant materials is that of creating visual screens, as shown in the after sketch. In the before sketch the house has an awkward relationship to the land. After the establishment of plantings, the house becomes integral to the landscape. Compositionally, views are framed into the house and the plants direct movements to desired locations.

4. Use native trees for the basic visual effect. Other plantings may become secondary after a framework of trees is established.

5. Arrange trees to simulate natural stands. Stiff, geometrical, formal, symmetrical, or regular spacings in rows are out of character in natural settings.

6. Consider canopy trees to give a community structure and character. Canopy trees unify sites, filter sunlight, provide shade, and soften architectural lines.

7. Consider using intermediate trees. They can be employed to define smaller spaces, screen, windbreak, or add visual interest.

8. Use native shrubs. Shrubs can be used for enclosure, privacy, reinforcement of paved surfaces, accent points, etc. Shrubs work well when used within a context that occurs with natural vegetative associations.

9. Use groundcovers and vines. In addition to covering ground surfaces, this class of plants retains soil and moisture and defines paths and other use areas. Vines are used in association with slopes, dunes, walls, and fences.

10. Consider that a limited palette of plants works best--using existing plants and plants of the same species, where necessary, is the most effective means to maintain simplicity.

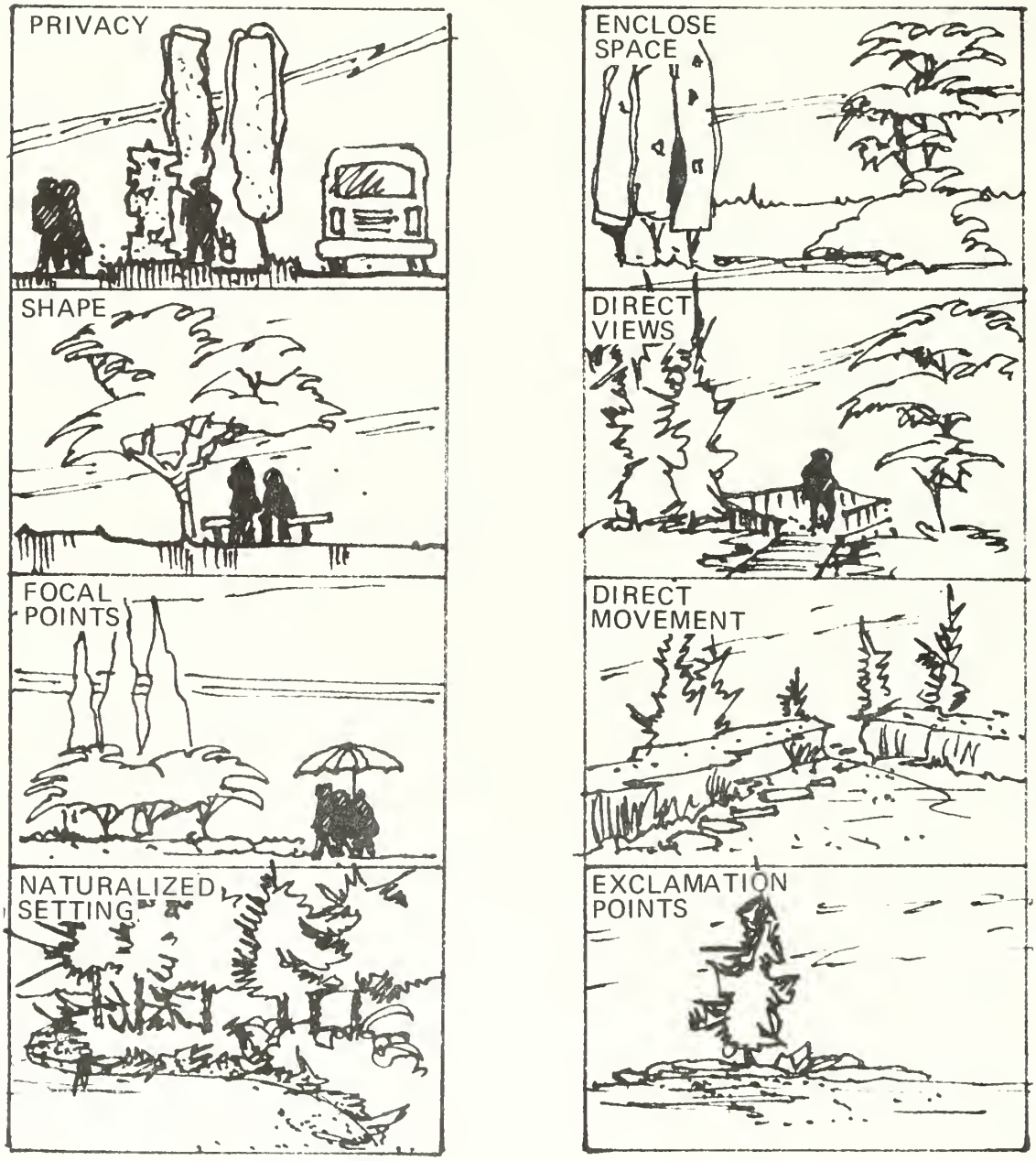
The sources and references listed in the reference section of this document illustrate additional uses of plants. These should be consulted to meet the needs of specific situations.

Vegetation Checklist

Vegetation
- successional stage
- native or exotic
- location, size, health
- appearance
- maintenance required
- energy impact

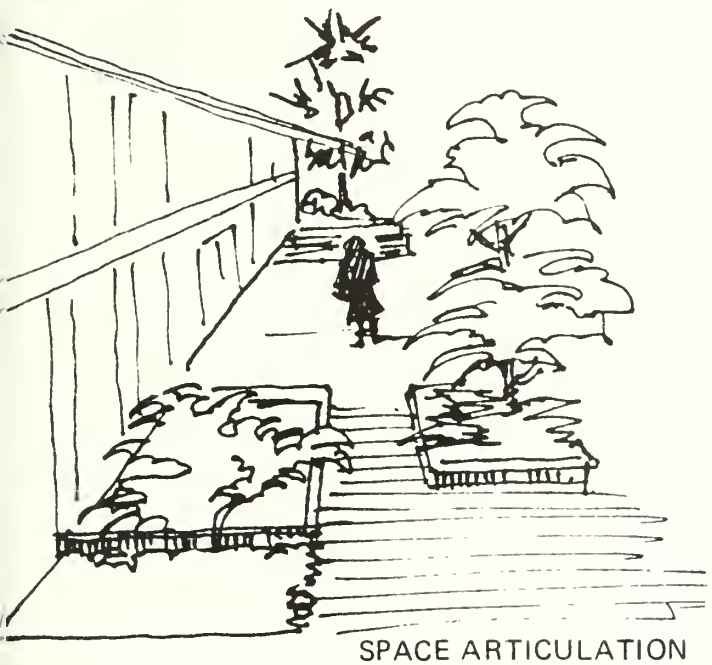
Plantlife in relationship to
- geology
- physiography
- hydrology
- soils
- climate

Vegetation for wildlife potential
- food
- water
- cover

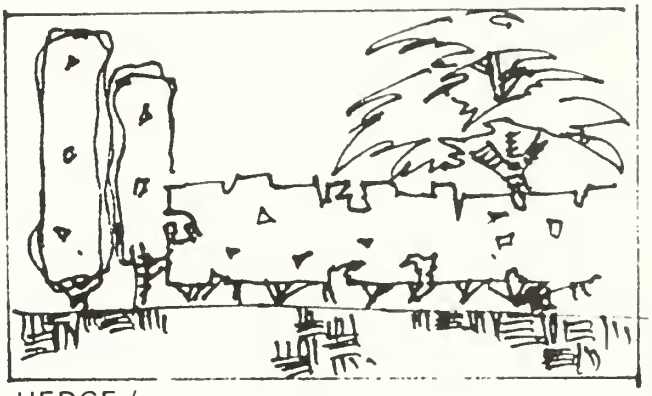


Outside of landform or terrain features, plants are the next most common element in the landscape. The sketches show only some of the ways plants can be used in a compositional sense. Each site must be assessed for existing attributes, functions, and compositional relationships.

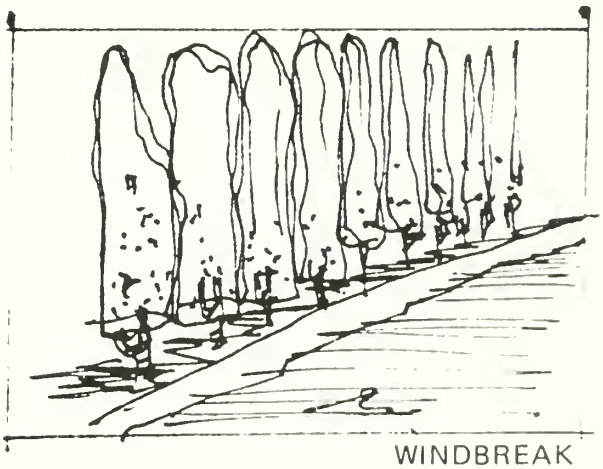
Some typical uses for plants are demonstrated here. Their purpose as privacy screens, windbreaks, and space articulators are understood.



SPACE ARTICULATION



HEDGE /
PRIVACY SCREEN



WINDBREAK

Less understood, perhaps, is their significant role in deadening sound, oxygenation, particulate control, soil retention, filtering light, moisture control, and giving positive aesthetic values.

PLANTS AS ENVIRONMENTAL MODIFIERS

SITE DESIGN PRINCIPLES

PRINCIPLES FOR GRADING/SLOPES/EXCAVATION

Grading practices are based on various considerations, primarily visual context, climate, existing topographic features, and soils and substrates. These four primary variables largely determine the range of which grading solution is used. For example, streets in residential areas are held to a gradient of 8 percent or less.

Standards for grading have been compiled from data published in reference manuals, standard specification outlines, federal publications, and building codes. As one can expect, other standards exist that would conflict with those here. Standards are guideposts and should not be viewed as absolute. Some general principles for excavation, grading, and slopes follow; more specific principles are given after that.

Principles for Excavation and Grading

Keep to an absolute minimum.

Balance the on-site cut and fill. Off-site borrow or disposition is expensive.

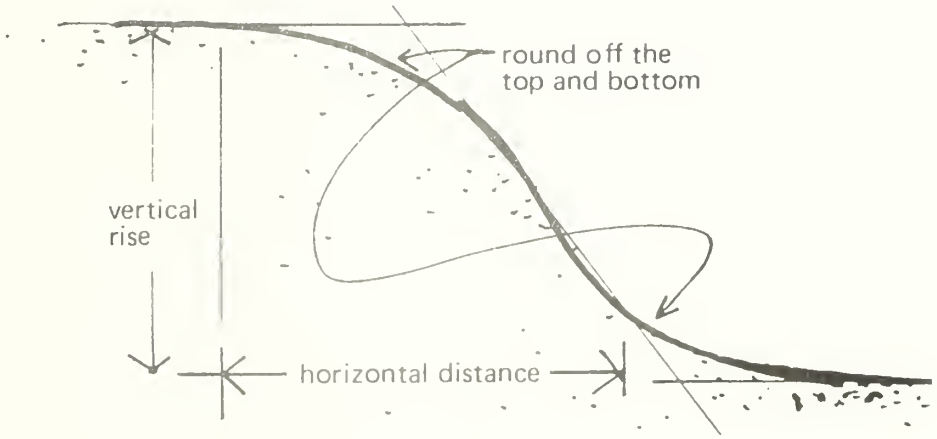
Protect trees and established ground covers.

Remove and stockpile the topsoil.

Avoid working the soil when it is wet, powder-dry, or frozen.

Provide positive surface drainage away from buildings to swales, gutters, drain inlets, or outfalls.

Reestablish ground covers without delay. Unprotected soils cause erosion and siltation.



Most slopes are best blended into the natural landforms.

Principles for Slopes (Earth Cut or Fill)

Do not exceed the angle of repose of the soils being cut or placed or a slope of 1 on 1½ maximum (1 foot of vertical rise for 1½ feet of horizontal distance).

A slope of 1 on 2 maximum is recommended for mulched or planted embankments.

A slope of 1 on 3 maximum is preferred for lawn areas to facilitate mowing.

Place fill material in uniform layers of 6 to 8 inches of loose material.

Allow for soil shrinkage (or swelling in some instances); 3 to 5 percent shrinkage is normal in compacted fills.

Provide mechanical compaction. Natural compaction by the eventual settlement of loosely placed soils is seldom uniform or complete.

All fills should be compacted fills, placed on prepared benches cut through topsoil and overburden.

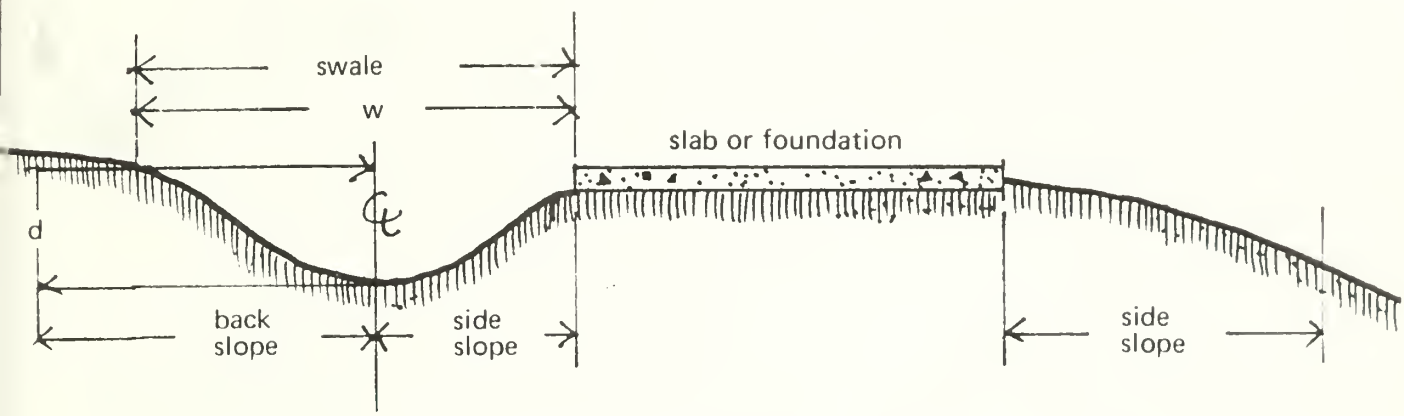
Thrust benches and positive drainage must be provided at the base of major fills.

Standards for Slopes Adjacent to Buildings. Two primary considerations must be addressed: a) to give pedestrians and vehicles access to the structure, and b) to divert surface water away from the structure (see following figure and table).

Grading Adjacent Land. Refer to the following figure and table for standards for grading various categories of adjacent general landscape areas.

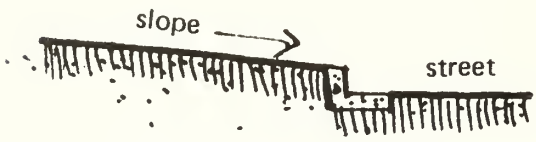
Standards for Grading Streets and Ways. Refer to the following figure and table for standards for the slopes of various kinds of roads, trails, and greenways associated with these categories of circulation.

Standards for Drainage Features. Refer to the following figure and table for standards for the slopes of drainage channels. A general standard exists to address the need of surface drainage features.

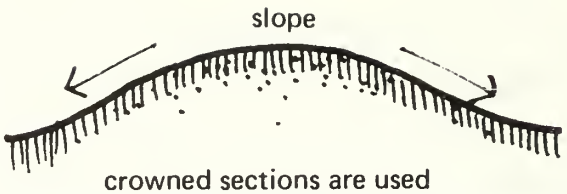


SLOPES ADJACENT TO BUILDINGS

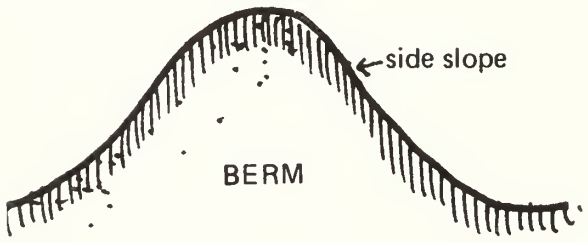
Condition	Maximum		Minimum		Range Preferred
side slopes with vehicular access	10%	10:1	0.5%	200:1	1-3%
back slopes with vehicular access	15%	6.66:1	0.5%	200:1	1-5%
side slopes without vehicular access	15%	6.66:1	0.5%	200:1	1-10%
back slopes without vehicular access	20%	5:1	0.5%	200:1	1-10%

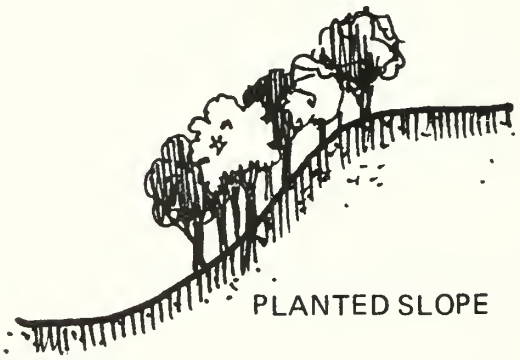


lawn areas slope to street or drainage channel



crowned sections are used for athletic fields, play areas, and traffic islands



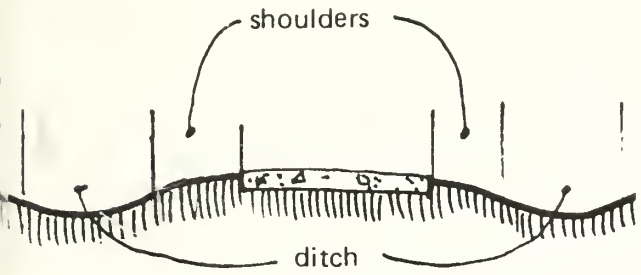


Berm side slopes and planted slopes must be carefully selected, depending on plant cover and soil.

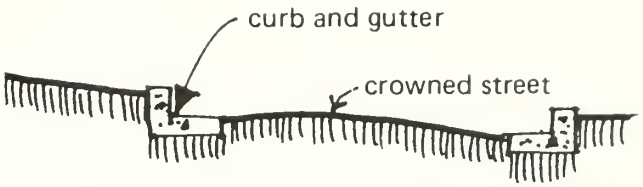
SLOPES OF GENERAL LANDSCAPE AREAS

Condition	Maximum		Minimum		Preferred
lawns and grass areas	25%	4:1[a]	1%	100:1	1.5-10%
grassed athletic fields	2%	50:1	0.5%	200:1	1%
berms and mounds	20%	5:1	5%	20:1	10%
mowed slopes	25%	4:1[a]	--		20%
unmowed grass banks	material of repose		--		25%
planted slopes and beds	10%	10:1	0.5%	200:1	3-5%[b]

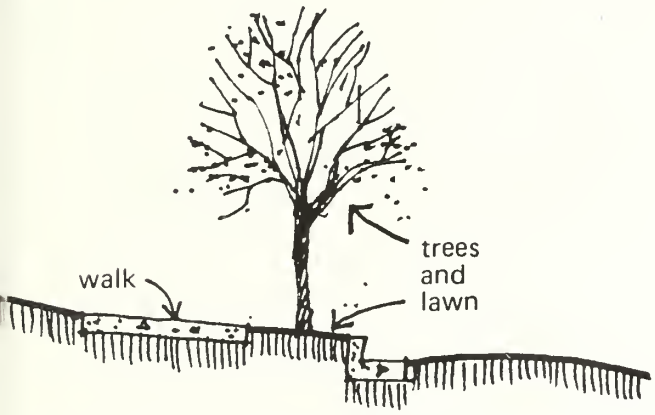
a. The maximum slope that mowing machinery can work on is approximately 25%.
b. Slopes covered only by shrub material will tend to erode above 10%.



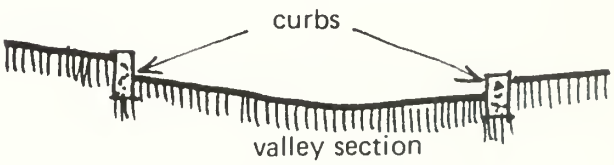
TRAILS, RURAL ROADS, HIGHWAY



URBAN STREETS AND PUBLIC PARKING



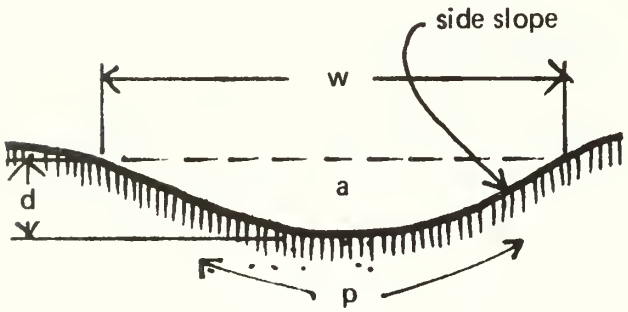
LOCAL AND FEEDER STREETS



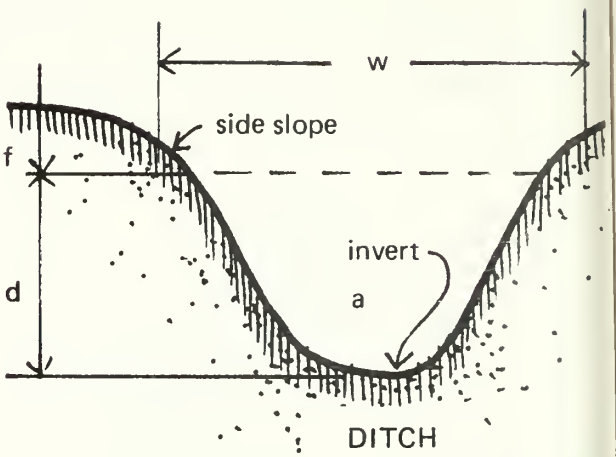
PARKING AREAS, UTILITY
AND SERVICE ROADS

SLOPES OF STREETS AND WAYS

Condition	Maximum		Minimum		Preferred	
crown of improved streets	3%	33 1/3:1	1%	100:1	2%	50:1
crown of unimproved streets	3%	33 1/3:1	2%	50:1	2.5%	40:1
slide slope on walks	4%	25:1	1%	100:1	1-2%	
tree lawns	20%	5:1	1%	100:1	2-3%	
slope of shoulders	15%	66 2/3:1	1%	100:1	2-3%	
longitudinal slope of streets	20%	5:1	0.5%	200:1	1-10%	
longitudinal slope of driveways	20%	5:1	0.25%	400:1	1-10%	
longitudinal slope of parking areas	5%	20:1	0.25%	400:1	2-3%	
longitudinal slope of sidewalks	10%	10:1	0.5%	200:1	1-5%	
longitudinal slope of valleyed section	5%	25:1	0.5%	200:1	2-3%	

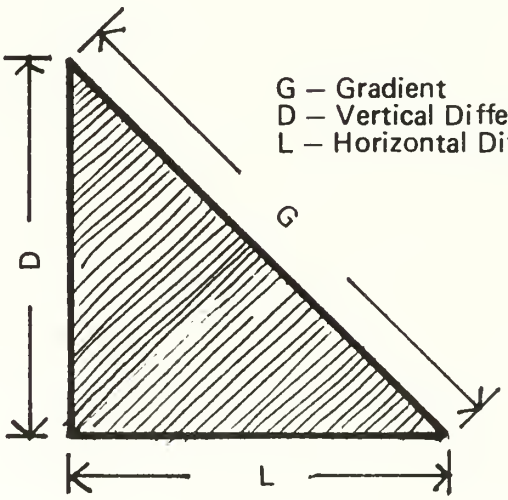


SWALE



DITCH

w - width of the channel
d - depth of the channel
a - area of the cross-section
p - wetted perimeter
f - freeboard
invert - bottom elevation of the channel



G — Gradient
D — Vertical Difference
L — Horizontal Difference

SLOPES OF DRAINAGE CHANNELS

Condition	Maximum		Minimum		Preferred
swale side slopes	10%	10:1	1%	100.1	2%
longitudinal slope of swales					
a) grass invert	8%	12.5:1	1%	100:1	1.5-2%
b) paved invert	12%	8.33:1	0.5%	100:1	4-6%
ditchside slopes		of repose	--		20-25%
a) grass invert	8%	12.5:1	1%	100:1	2-3%
b) paved invert	10%		--		5-6%

PRINCIPLES FOR PEDESTRIAN WAYS--WALKS AND STEPS

One of the best measures of a design is how well a pedestrian experiences the project. The relationship of walking the site where the design elements are artfully woven into the landscape will enhance the experience. The following standards that apply to circulation are suggested for walks, steps, and ramps.

Slope Gradient for Walks

1% to 3%	- most comfortable
3%	- side slope maximum
5%	- acceptable for short distances
6%	- suggested maximum for ice and snow conditions
10%	- for short distances without ice and snow

Steps/Ramps

Except as a landscape feature, steps should be avoided if possible.

Alternate access ramps for the handicapped should be provided.

Steps should occur in pairs in the outdoors. Single steps are often invisible and pose a hazard. Stairs consisting of nine risers should be broken by a landing. In flights of steps, the risers should be of uniform height. In free-form or naturalized flights of steps (where consistency is not anticipated), riser and tread dimensions may vary widely within a given flight.

A wood float or light broom finish or the use of abrasive textures is suggested on concrete steps to ensure good traction. In rough terrain particularly, perrons (as in a stepped ramp) may be desirable on slopes ranging in grade from 16 to 25 percent. Smooth surfaces turn slick when wet and should be avoided. In general, outdoor steps are arranged to be larger than interior steps.

6 inches	- recommended riser height
14½-15 inches	- tread
rule of thumb	- riser + tread = 21 inches

PRINCIPLES FOR BICYCLE WAYS

1% to 3%	- desirable gradient
3% to 5%	- places a strain on the cyclist
5%	- grades in excess of 5% should be avoided
3 feet	- suggested width for bike trail lanes
7 feet	- suggested width for two-lane bike trail

OTHER SITE DESIGN PRINCIPLES

There are numerous references that contain valuable information to properly prepare a good site plan. Such information is basic to the training, research, knowledge, and skills of the design professionals. Many sources (such as Austin's Designing the Natural Landscape, Diedelmann and Schuster's Natural Landscaping, Landphair and Klatt's Landscape Architecture Construction, Lynch and Hack's Site Planning, NPS's Cultural Landscapes: Rural Historic Districts in the National Park System, Robinette and McClennon's Landscape Planning for Energy Conservation, Seddon and Corkill's Manual: Design and Control of Land Development in Suburban Communities, Simond's Landscape Architecture, and Smyser's Nature's Design--see "References" section) can provide a basic and extensive understanding of the principles utilized in site design, including principles of site drainage, site furnishings, roads and driveways, parking, and landscape planting.

CONTENTS FOR UNIT DESIGN CHAPTER

BASIC UNIT DESIGN CHECKLIST
- Compatibility with Site
- Compatibility with Park
- Compatibility with Historic Zones or Districts
- Compatibility with Region
- Livability
- Quality Control Considerations
- Main Entrance
- Family Entrance
- Windows
- Doors
- Basements
- Insulation
- Acoustic Control
- Radon Mitigation
- Electrical
- Mechanical
- Cold Climate Considerations

LIVING ROOM CHECKLIST

DINING ROOM CHECKLIST

KITCHEN CHECKLIST

BATHROOM CHECKLIST

BEDROOM CHECKLIST

CLOSETS AND STORAGE CHECKLIST

LAUNDRY CHECKLIST

BASIC UNIT DESIGN CHECKLIST*

COMPATIBILITY WITH SITE (see also "Site Design" chapter)

Unit is in harmony with overall landscape character and does not dominate the visual character of site.
Unit is designed and sited to minimize physical and visual impacts on adjacent cultural resources and character of the area.
Exterior design treatments key on the specific details of the site (color, texture, material, shadows, etc.).
Unit maximizes indoor/outdoor relationship of living spaces if climate permits.
Unit orientation and floor plan allow morning sun to brighten bedrooms and kitchen and protects against possible overheating effects of late afternoon sun.
Unit design responds to climatic features for passive heating and cooling (see "Climatic Design" chapter).
Snow country unit design addresses roof loads, prevention of ice dams, overhead protection for entryways, height of living level and windows versus snow depth, areas for stockpiling snow, tiled foyers/mudroom, moisture staining of siding, etc.

COMPATIBILITY WITH PARK

Unit complies with park's housing management plan.
Unit complies with approved planning documents.
Unit complements park design theme (see "Park Design Theme" chapter).

COMPATIBILITY WITH HISTORIC ZONES OR DISTRICTS

Contemporary structures built onto historic structures, in historic districts, or visually or physically associated with such structures, should harmonize with the existing ones. Contemporary structures should be designed with consideration of scale, texture, and continuity (as defined in NPS-28) to blend with, rather than duplicate or mimic, the historic structures.

---

*Much of the information in this chapter has been taken from minimum design and construction standards developed by the Department of Housing and Urban Development.

COMPATIBILITY WITH REGION

Unit design incorporates indigenous strategies for tempering the climate.
Unit design capitalizes on locally available building materials and construction techniques.

LIVABILITY (see following sections on individual room design)

Housing unit design shall provide for a safe, secure, healthful, and attractive living facility and environment suited to the needs of the employee and any associated family members. It shall provide for ease of circulation and housekeeping, visual and auditory privacy, appropriate light and ventilation, fire and accident protection, economy in maintenance and use of space, accessory services, and sanitation facilities.

Seasonal housing shall meet the preceding livability objective for the intended season of occupancy, even when strict compliance with the design guidelines is deemed physically or operationally impractical.

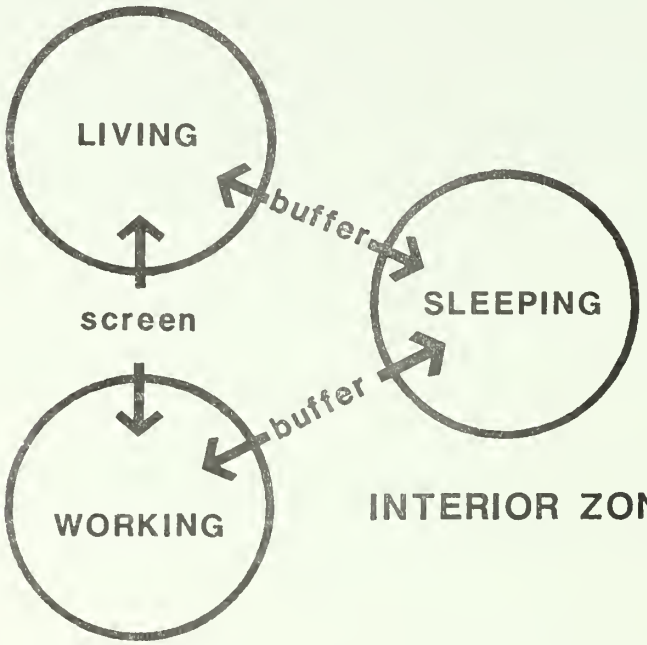
Site and unit design provide separation of public, semipublic, semiprivate, and private living zones.

Floor plan establishes three separate interior zones:

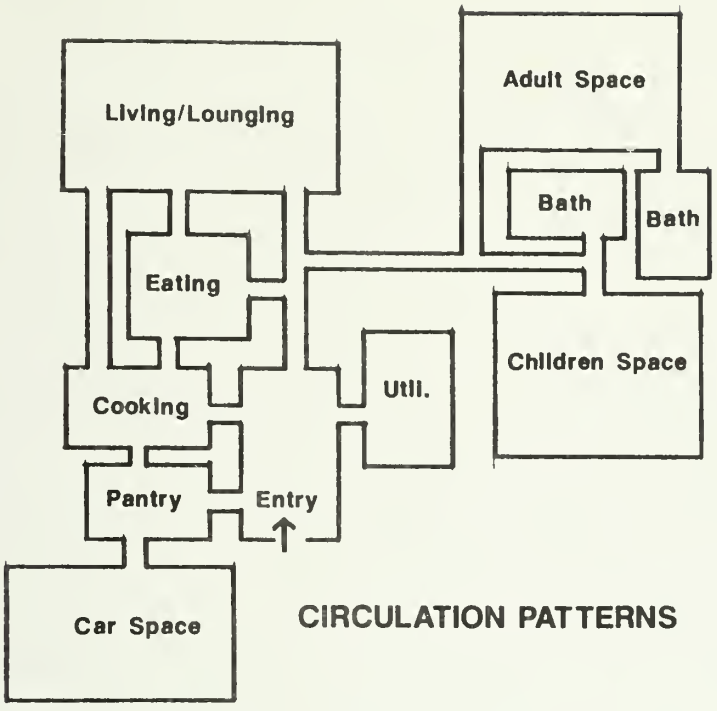
1) living - living room, dining room, family room

2) working - kitchen, laundry, workshop (screened from living zone)

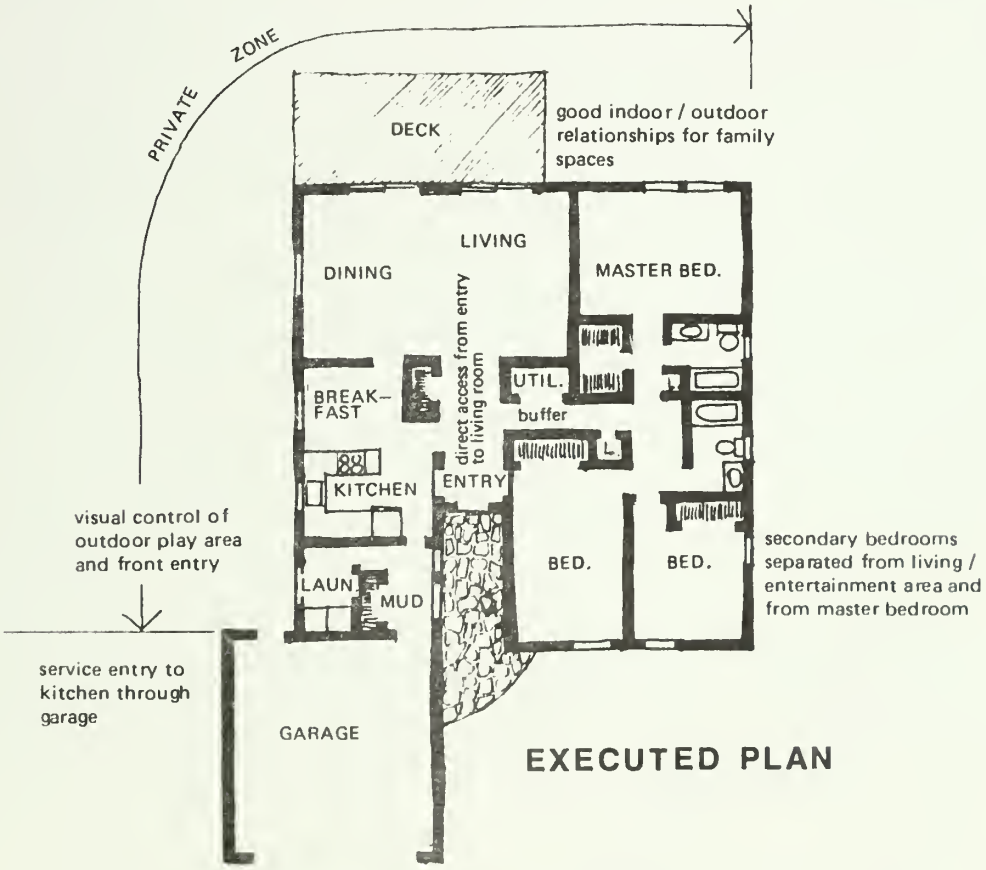
3) sleeping - bedrooms (buffered from living and working zones)



INTERIOR ZONING



CIRCULATION PATTERNS



EXECUTED PLAN

Minimum Room Sizes for Separate Rooms

Name of Space*	Minimum Area (Sq Ft) LU with 0-BR	LU with 1-BR	LU with 2-BR	LU with 3-BR	LU with 4-BR	Least Dimension
LR	NA	160	160	170	180	11'-0"
DR	NA	100	100	110	120	8'-4"
BR (primary)	NA	120	120	120	120	9'-4"
BR (secondary)	NA	NA	80	80	80	8'-0"
Total area, BRs	NA	120	200	280	380	---
OHR	NA	80	80	80	80	8'-0"

*Abbreviations:

LU = living unit
LR = living room
DR = dining room
DA = dining area
0-BR = LU with no separate bedroom
K = kitchen
NA = not applicable
BR = bedroom
OHR = other habitable room
SL = sleeping area

Minimum Room Sizes for Combined Spaces

The minimum dimensions of a combined room shall be the sum of the dimensions of the individual single rooms involved, except for the overlap or combined use of space.

For two adjacent spaces to be considered a combined room, the horizontal opening between spaces shall be at least 8 ft - 0 in., except that between kitchen and dining functions, the opening may be reduced to 6 ft - 0 in. Spaces not providing this degree of openness shall meet minimum room sizes required for separate rooms.

A combined LR-DA-K shall comply with the following: the food preparation-cooking area shall be screened from the living room sitting area and the clear opening between the kitchen and dining area shall be at least 4 ft - 0 in.

QUALITY CONTROL CONSIDERATIONS

Design should be livable, buildable, maintainable, and safe.
Operation and maintenance manual should be prepared for equipment and materials of each house.

Equipment specified should be familiar to region and tested for climate.
Specified equipment should provide long life and ease of operation and maintenance.
Building should function during power outages.
Seasonally operated housing should be easy to close down or start up.

MAIN ENTRANCE

Provides space to receive guests and store coats, and allows convenient access to living room.
Can be easily accessed from driveway or street; is identifiable and welcoming.
Can be easily accessed from interior spaces, especially the kitchen.
Serves to buffer weather elements from entering house and has overhead protection against rain, snow, and roof runoff.
Has a view window for seeing who is at door before opening it.

FAMILY ENTRANCE

Provides back/side door access to kitchen.
Should not funnel traffic directly into kitchen work triangle.
Has weather protection along route from car.
Has bathroom nearby to minimize traffic (especially children) from backyard through house.

WINDOWS

Most important factor in making rooms appear pleasant.
For nontropical climates, priority for window placement is: south-facing, east/west facing, north-facing.
Allow some unbroken wall space for furniture placement.
Provide egresss-sized windows in sleeping areas.
Use double pane thermal glazing in areas having more than 3,000 heating degree days (HDD) (2,000 HDD if unit has electric heat).
Use triple pane thermal glazing in areas having more than 5,500 HDD.
Provide natural light and ventilation in each habitable room of a house or living unit, except for the kitchen and small alcoves in at least the following amounts:

glass area per room - 10 percent of floor area
natural ventilation per room - 5 percent of floor area

Properly designed mechanical ventilation is acceptable instead of natural, and shall be provided for interior kitchens and baths.

DOORS

Doorway openings shall be adequate in size to admit furniture and equipment to all rooms and other spaces.

Provide a door for each entrance to a living unit or house, and within the living unit or house for each opening to a bedroom, bathroom, and toilet compartment.

Doors to and within Living Units or Houses

The following door sizes should be considered minimum for the locations shown.

Location	Width	Height
a. Entrance to living unit	3'-0"	6'-8"
b. Service to living unit	2'-6"	6'-8"
c. Habitable room	2'-6"	6'-8"
d. Bathrooms, toilet compartments	2'-0"	6'-8"
e. Closets, other than linen or broom, or folding doors for wardrobe closets	2'-0"	6'-6"
f. Folding or sliding doors (within living unit)	Unobstructed opening not less than specified in c, d, and e.	

Note: Doorways into accessible units and rooms shall have a 32" minimum clear opening.

BASEMENTS

Houses with basements usually have more storage and general purpose space. There is usually space for children's play, minor carpentry, household repairs, and storage space for all types of articles having indoor and outdoor seasonal uses.

In climates where frost requires deep footings, basements are a wiser choice than the resulting generous crawl space. An additional benefit is that a full basement can help to elevate the main living level above winter snow depths.

Houses without basements should have what may be called a "basement equivalent" above grade. This space may be on the main floor or in an attic. It is not necessary for the size of such a space to approach that of a basement. However, this "basement equivalent" should be large enough to provide for the family activities mentioned above. The location of such a space adjacent to the kitchen provides the advantage of being

able to supervise children's play. The service entrance to the house often is located here and provides a convenient mud room in bad weather.

Light and Ventilation

Where habitable rooms are in a basement space, the light and ventilation requirements for habitable rooms should apply. Combustion air is necessary for heating equipment located in enclosed spaces.

INSULATION

R-Value Requirements

The zone map above highlights regional minimum R-value requirements necessary to comply with the new CABO Model Energy Code.

Zone	Ceiling R-Value	Wall R-Value	Floor R-Value
1	R-19	R-12	R-11
2	R-30	R-19	R-11
3	R-38	R-19	R-14
4	R-38	R-19	R-22
5	R-49	R-19	R-25

Source: Mineral Insulation Manufacturers Association

ACOUSTIC CONTROL*

The following criteria should be used to establish acoustic protection between one living unit and adjoining living units, public spaces, or service areas.

Airborne Sound Insulation

Wall and floor/ceiling assemblies must meet a sound transmission class (STC) of 50.

Note: Penetrations or openings in construction assemblies for bathtubs, recessed cabinets, and mechanical, plumbing, and electrical services must be sealed and insulated to maintain the STC rating.

Impact Sound Insulation

Floor assemblies must meet an impact insulation class (IIC) of 50.

---

*This information is based on the requirements defined in Uniform Building Code (1988 UBC) and HUD document FT/TS-24, "A Guide to Airborne, Impact and Structureborne Noise-Control In Multi-Family Dwellings," 1974 (see "References" section).

RADON MITIGATION

New Construction

Refer to results of radon tests conducted on adjacent structures.
When construction area shows high potential for radon
- include radon mitigation devices as part of construction contract
- test housing unit before and after occupancy to determine if mitigation system should be activated

When no information is available on radon potential of site:
- conduct soil test for radon
- if in doubt, it is more prudent to include a radon mitigation system as part of construction contract than to retrofit the house later

Reference to be consulted
Radon Reduction in New Construction (An Interim Guide)
OPA-87-009 August 1987
by EPA Office of Air and Radiation
and EPA Office of Research and Development
Washington, D.C. 20460

Rehabilitation Projects

Refer to results of prior radon testing of unit.
If a radon mitigation system has been installed, ensure its continued effectiveness following rehabilitation.
Retest all housing units following rehabilitation.

Reference to be consulted:
Radon Reduction Techniques for Detached Houses - Technical Guidance, 2nd edition
EPA G25/5-87/019
EPA Office of Research and Development
Washington, D.C. 20460

ELECTRICAL

Provide GFCI outlets in bath, kitchen, and other wet locations.
Locate light switches at entry/exit point of each room.
Provide outdoor light at each entryway.
Provide GFCI outlets and lighting for outdoor living spaces.

MECHANICAL

Use high-efficiency furnaces and water heaters with spark ignitions and vent dampers when possible.
Provide set-back thermostat.
Centralize meters at one outside location, but away from outdoor living areas.
All multiple occupancy units must have separate heating zones for individual sleeping areas. Individual room zone control is highly desirable in all living units.

COLD CLIMATE CONSIDERATIONS

Beware of window frosting and icing that may freeze egrees windows shut.
Use thermal films on windows to allow solar heating to come in while keeping room heat from quickly escaping.
Use air-to-air heat exchangers to ventilate tightly built homes.
Design roofs for snow loads, prevention of ice dams, and overhead protection at doorways.
Beware of snow infiltration where cold roofs are used in wind-prone areas.
Consider height of living level versus snow depth.
Plan for areas where plowed and shovelled snow can be stockpiled.
Incorporate mudroom/air lock entryways in design.
Guide against moisture staining wood materials near grade.

LIVING ROOM CHECKLIST

General

Each living unit shall contain space that is conducive to general family living activities, among which are entertaining, reading, writing, listening to music, watching television, relaxing, and frequently children's play. Unless specifically provided for elsewhere in the unit, appropriate space for these activities shall be provided in the living area.

Furniture to be accommodated in the living area may include the following items (sizes are minimums):

1 - couch, 3'0" x 6'10"
2 - easy chairs, 2'6" x 3'0"
1 - desk, 1'8" x 3'6"
1 - desk chair, 1'6" x 1'6"
1 - television set, 1'4" x 2'8"
1 - table, 1'6" x 2'6"

Necessary planning considerations should include: provision of adequate floor and wall space for furniture groupings, a 10-12 foot unbroken wall for a couch, separation of trafficways from centers of activity, and ease of access to furniture and windows.

Circulation

Convenient use of and access to furniture in the living space should provide the following minimum clearances.

60" minimum between facing seating
24" minimum clearance where circulation occurs between furniture
30" minimum clearance for use of desk
36" minimum clearance for main trafficway
60" minimum distance between television set and seating

Circulation through the living room should be as direct as possible, yet it should not interfere with the furniture placement. A "dead end" living room, with circulation passing through along one end often works well.

Doors

The location of doors should fully consider the need for generous wall space for the placement of furniture. The front door should not open directly into the living room.

Conversation Area

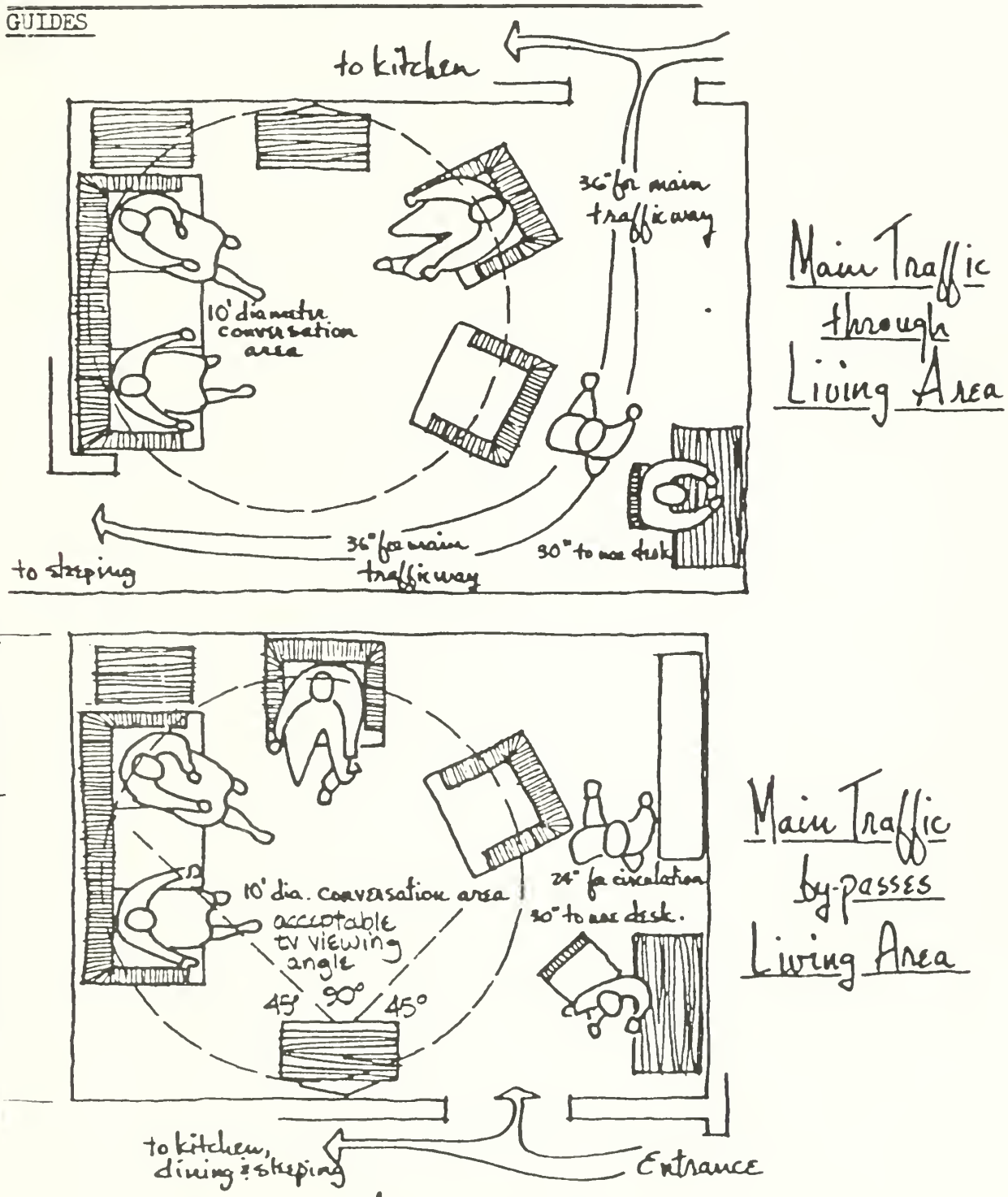
People gather or congregate during social activities in rather small groups. A desirable conversation distance is of relatively small size, approximately 10 feet in diameter.

Windows

Orient picture windows to private courts or views to prevent "fishbowl" viewing from public areas.

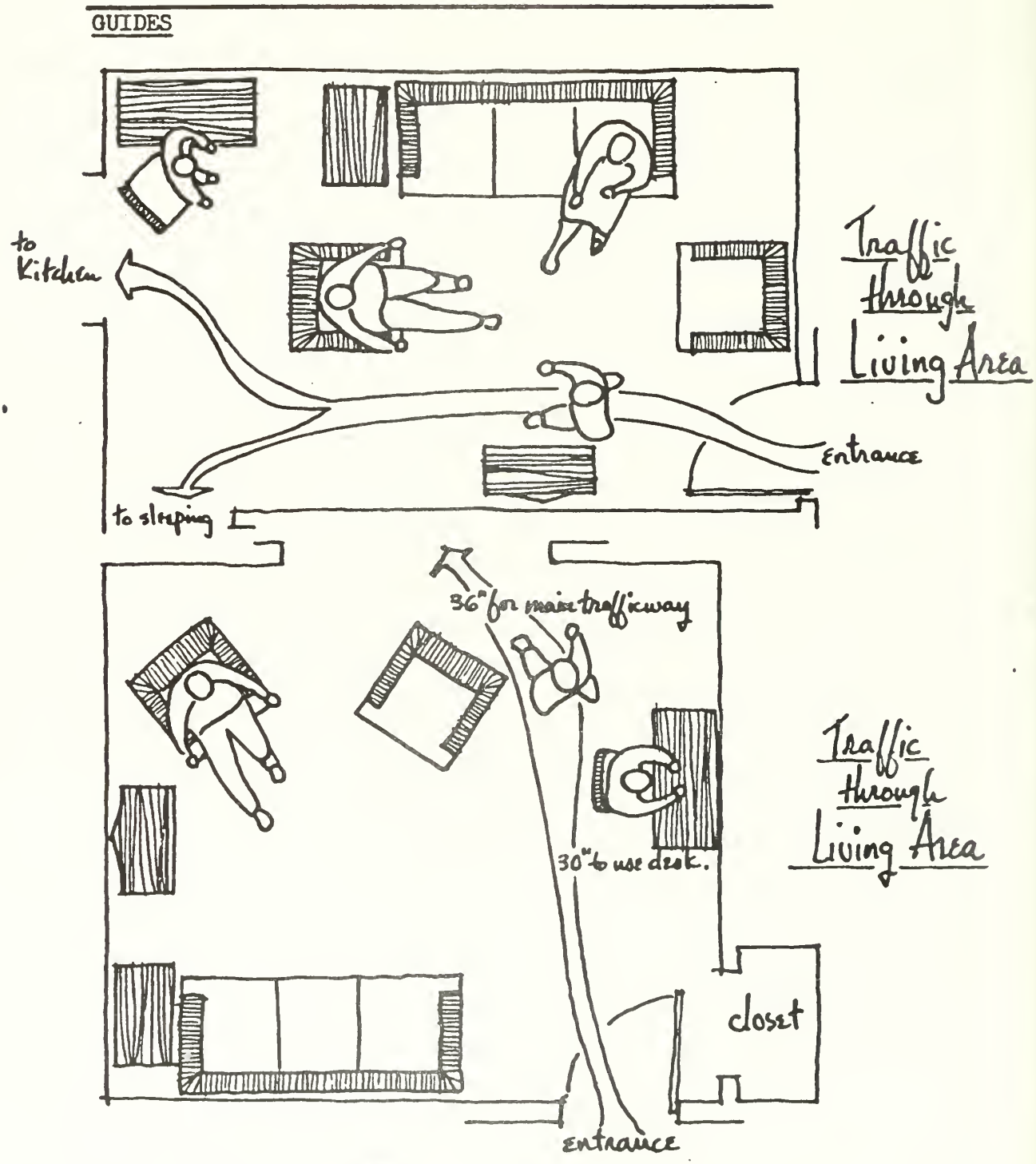
This and the following figures in this section are the unit design criteria established by HUD for Operations Breakthrough (RFP-H-55-69).

Figure 3-1



Minimum Clearances, Circulation and Conversation Areas for Living Rooms

Figure 3-2



Minimum Clearances, Circulation and Conversation Areas for Living Rooms

DINING ROOM CHECKLIST

Each living unit shall contain space for the purpose of dining. This area may be combined with the living room or kitchen, or may be a separate room.

The amount of space allocated to dining shall be based on the number of persons to be served and proper circulation space. Appropriate space shall be provided for the storage of china and large dining articles either in the dining area itself or in the adjacent kitchen.

Space for accommodating the following size tables and chairs in the dining area shall be provided, according to the intended occupancy, as shown:

1 or 2 persons	- 2'-6" x 2'-6"
4 persons	- 2'-6" x 3'-2"
6 persons	- 3'-4" x 4'-0" or 4'-0" round
8 persons	- 3'-4" x 6'-0" or 4'-0" x 4'-0"
10 persons	- 3'-4" x 8'-0" or 4'-0" x 6'-0"
12 persons	- 4'-0" x 8'-0"
Dining chairs	- 1'-6" x 1'-6"
*Buffet or storage units	- 1'-6" x 3'-6"

*Desirable additional furniture

Size of the individual eating space on the table should be based upon a frontage of 24 inches and an area of approximately 2 sq. ft. In addition, table space should be large enough to accommodate serving dishes.

Desirable room for seating is a clear 42" all around the dining table. The following minimum clearances from the edge of the table should be provided.

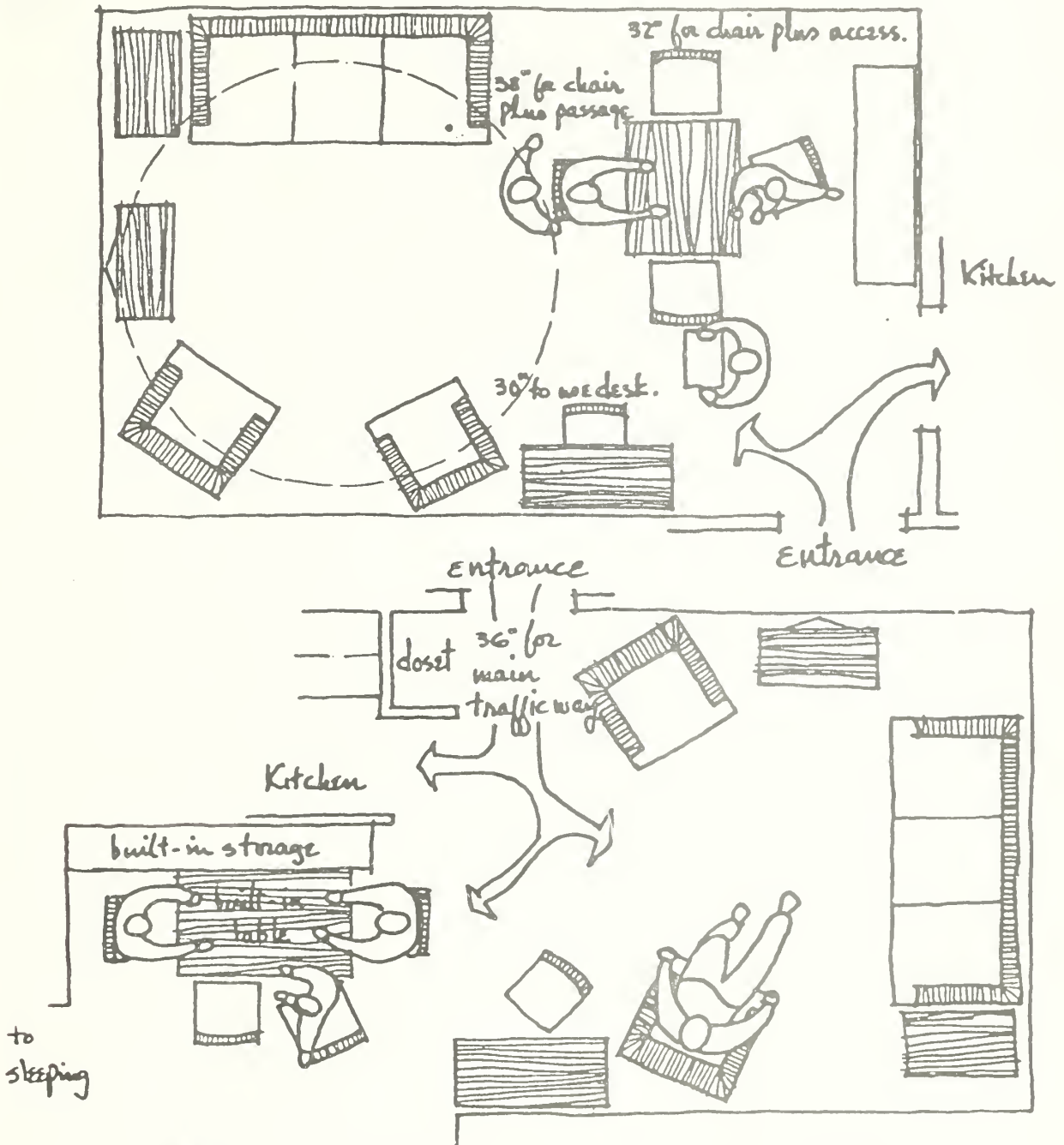
32" for chairs plus access thereto
38" for chairs plus access and passage
42" for serving from behind chair
24" for passage only
48" from table to base cabinet (in kitchen)

In sizing the separate dining room, provision should be made for circulation through the room in addition to space for dining.

The location of the dining area in the kitchen is desirable for small houses and small apartments. This preference appears to stem from two needs: (1) housekeeping advantages; (2) the dining table in the kitchen provides a meeting place for the entire family. Where only one dining location is feasible, locating the dining table in the living room is not recommended.

Figure 3-3

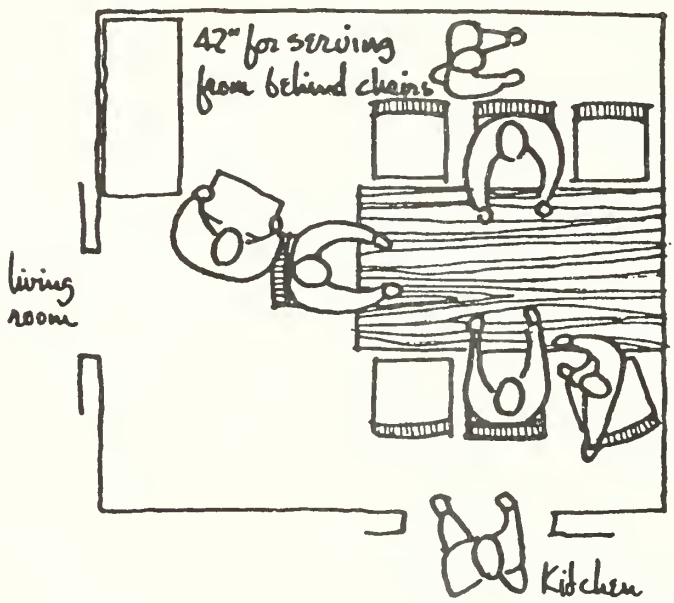
GUIDES



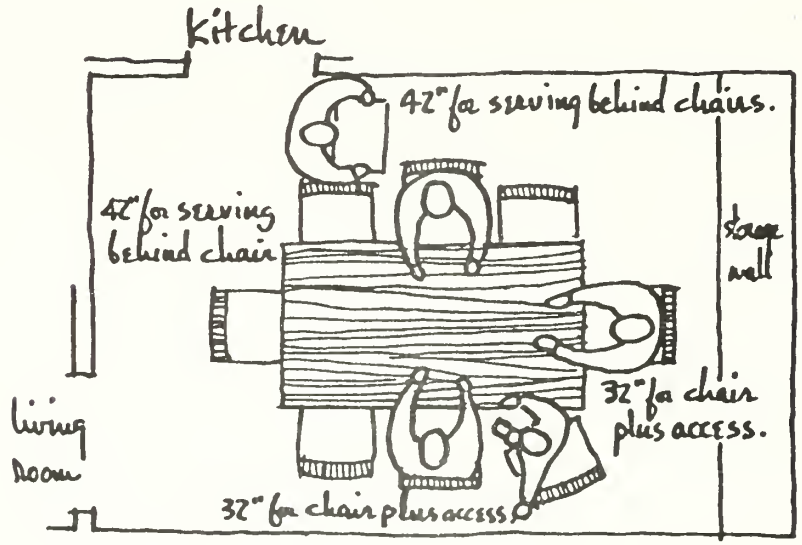
Minimum Clearances and Circulation for Combined Living - Dining Areas

Figure 3-4

GUIDES



One end of table against wall

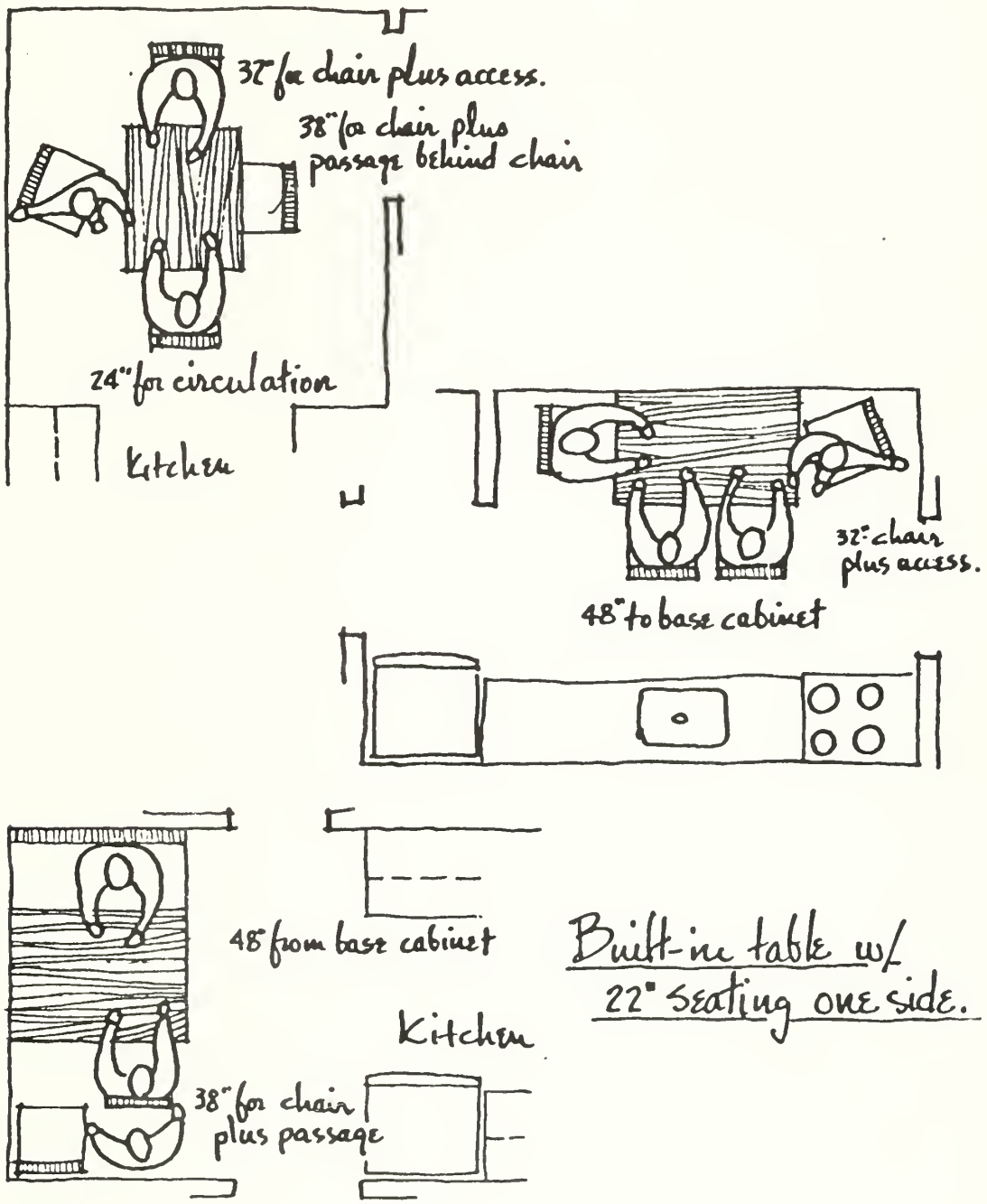


Serving from One End and One Side of Table

Minimum Clearances for Dining Areas

Figure 3-5

GUIDES


32" for chair plus access.
38" for chair plus passage behind chair
24" for circulation
Kitchen
32" chair plus access.
48" to base cabinet
48" from base cabinet
Built-in table w/ 22" seating one side.
Kitchen
38" for chair plus passage

Minimum Clearances for Dining Area in Kitchen

KITCHEN CHECKLIST

General

The basic activities in the kitchen consist of food preparation, serving, and cleanup after the meal. The kitchen design shall permit efficient operation in the performance of these functions. In addition, storage space for staples, dinnerware, and utensils shall be provided.

Location

The kitchen shall be conveniently located near the dining area, living area, and the utility area. The user should have easy access from the service entrance, or the only entrance if in an apartment. The kitchen shall provide direct access to the dining area.

Space

The size of the kitchen shall be determined by the number of bedrooms provided in the living unit. There should be direct access from driveway to kitchen with well protected access if parking area/garage is separated from house. Work centers for the following equipment, and cabinets and space for their use shall be provided:

Range space with base and wall cabinet at one side for serving and storage of utensils and staples.

Sink and base cabinet with counter space on each side for cleanup. Wall cabinets for storage of dinnerware.

Refrigerator space with counter space at latch side of the refrigerator door. Latch side of refrigerator should be side closest to sink.

Mixing counter and base cabinet for electrical appliances and utensil storage. Wall cabinet for staple storage.

The functions of the sink center are common to the other centers. It is recommended that the sink center's location be convenient to each of the others (usually between them). The refrigerator center is best located near the entry and the range center near the dining area.

Minimum Area

	Sq Ft/ Persons	Sq Ft/ Persons
Parallel counters (4'-0" minimum aisle)	68/3	86/6
L-shape counters	70/4	86/6
U-shape counters (5'-0" minimum aisle)	80/3	92/6
Broken-U counter	88/5	96/7

Light and Ventilation

Artificial ceiling light shall be provided and ventilation shall be provided by natural or mechanical means.

Work Centers

Table 3-1 shows recommended minimum space standards for kitchen work centers. The space to be provided is sized according to the number of bedrooms in the living unit.

Rules of thumb for average three-bedroom house:

perimeter of work triangle (connecting refrigerator/sink/range = 12-15 feet minimum, 22 feet maximum)

minimum countertop lengths
- 4½ feet between refrigerator latch side and sink
- 3½ to 4 feet between sink and range
- 2 feet other side of range

minimum storage areas
- 8½ running feet wall cabinets
- 10 sq ft of wall cabinet storage
- 20 sq ft base cabinet storage
- 6 sq ft additional storage for each person usually served

Height of Shelving and Countertops

Maximum height of wall shelving is 74 inches; height of countertops should be 36 inches.

Maximum clearance height between sink and wall cabinet is 24 inches; between base and wall cabinets--15 inches clearance. See figure 3-8 for other clearances.

Table 3-1. Minimum Frontages for Work Centers

Work Centers	Kitchenette		Kitchen		
(1)(2)(3)(4)	Zero (5) Bedroom	One Bedroom	Two Bedrooms	Three Bedrooms	Four or More Bedrooms
Sink	18"	24"	24"	24"	36"
counter and base cabinet at each side	15"	18"	20"	24"	30"
Range	21"	21"	24"	30"	30"
counter and base cabinet at either side	15"	18"	20"	24"	30"
counter between range and turn of counter	9"	9"	9"	9"	9"
Refrigerator (space)	30"	30"	36"	36"	36"
counter at latch side	15"	15"	15"	15"	18"
counter at latch side and turn of counter	16"	16"	16"	16"	16"
Mixing (base and wall cabinet)	20"	30"	36"	36"	42"

(1) Work centers may be combined; the kitchenette multiuse space should at least equal the largest frontage of any one of the work centers being combined; the kitchen multiuse space should at least equal the largest frontage of any one of the work centers being combined plus 6 inches.

(2) Provide a drawer at each base cabinet.

(3) Frontage may continue around a corner, except a space less than 12" should not be counted.

(4) The frontages are based on typical cabinets. Base cabinet approximately 24" deep x 36" in height with one shelf and a drawer. Wall cabinet approximately 12" deep x 30" in height with two adjustable shelves.

(5) A 72" compact kitchen with 72" wall cabinet may be substituted.

Recommended Minimum Edge Distance

Equipment should be placed to allow for efficient operating room between it and any adjacent corner cabinet. At least 9" from the edge of the sink and range and 16" at the side of the refrigerator is recommended. See figure 3-6.

Note: The placement of a range at the end of a run of base cabinets as shown in figure 3.6 can be dangerous (especially for children) when pot handles project over the edge of the open side. Although installation is more difficult, it is safer to locate ranges between two base cabinets or a base cabinet and end wall with a splatter shield.

Circulation Space

A minimum of 48" should be provided between base cabinets or appliances opposite each other. This same minimum clearance applies when a wall, storage wall, or work table is opposite a base cabinet.

Traffic

Circulation through kitchen should not interfere with work triangle. Serving circulation to the dining area should be without any cross traffic.

Additional Kitchen Considerations

Stainless steel sink is most durable, followed by enameled cast iron (not porcelainized steel)

Single-lever faucet at kitchen sink

Ample electrical outlets for countertop work surface

Eat-in kitchen table space

Laundry room nearby

Extra countertop space for microwave

Basic Considerations for Accessible Kitchens

Lowered sink with knee space below and lever-handle faucet

Lowered counter section, with knee space below, to serve as a work center

Lowered bottom shelf for wall cabinets over work center

Refrigerator/freezer heights below 54 inches

Front controls for range

Ample GFCI electrical outlets within easy reach

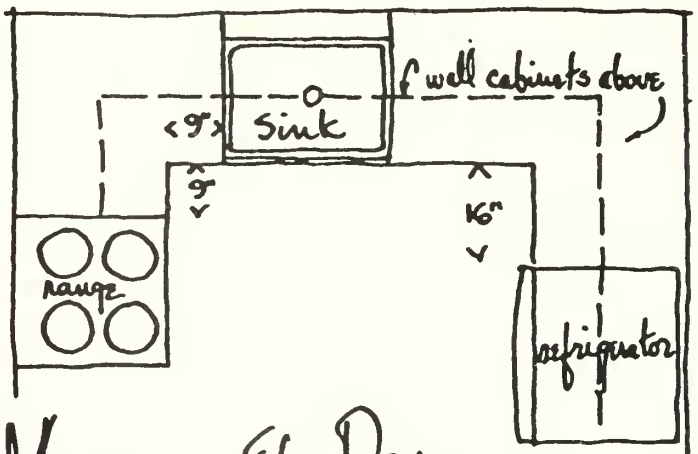
Additional base cabinet storage

Views open to outside or adjoining rooms

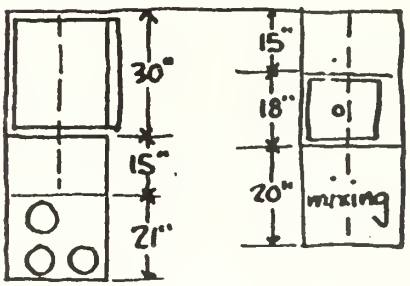
See "Uniform Federal Accessibility Standards" (UFAS) chapter 4.34.6 for specific requirements

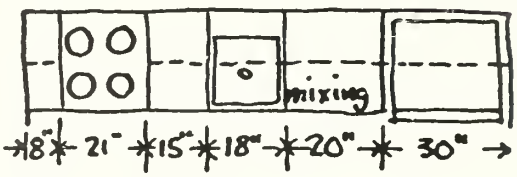
Figure 3-6

GUIDES

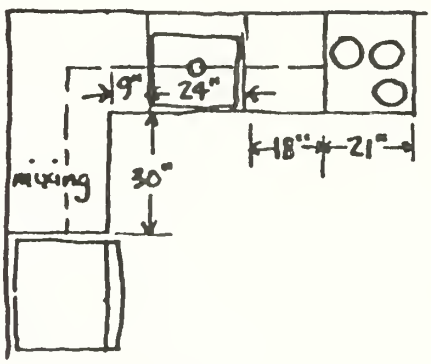


Minimum Edge Distances





Zero-Bedroom Kitchenettes

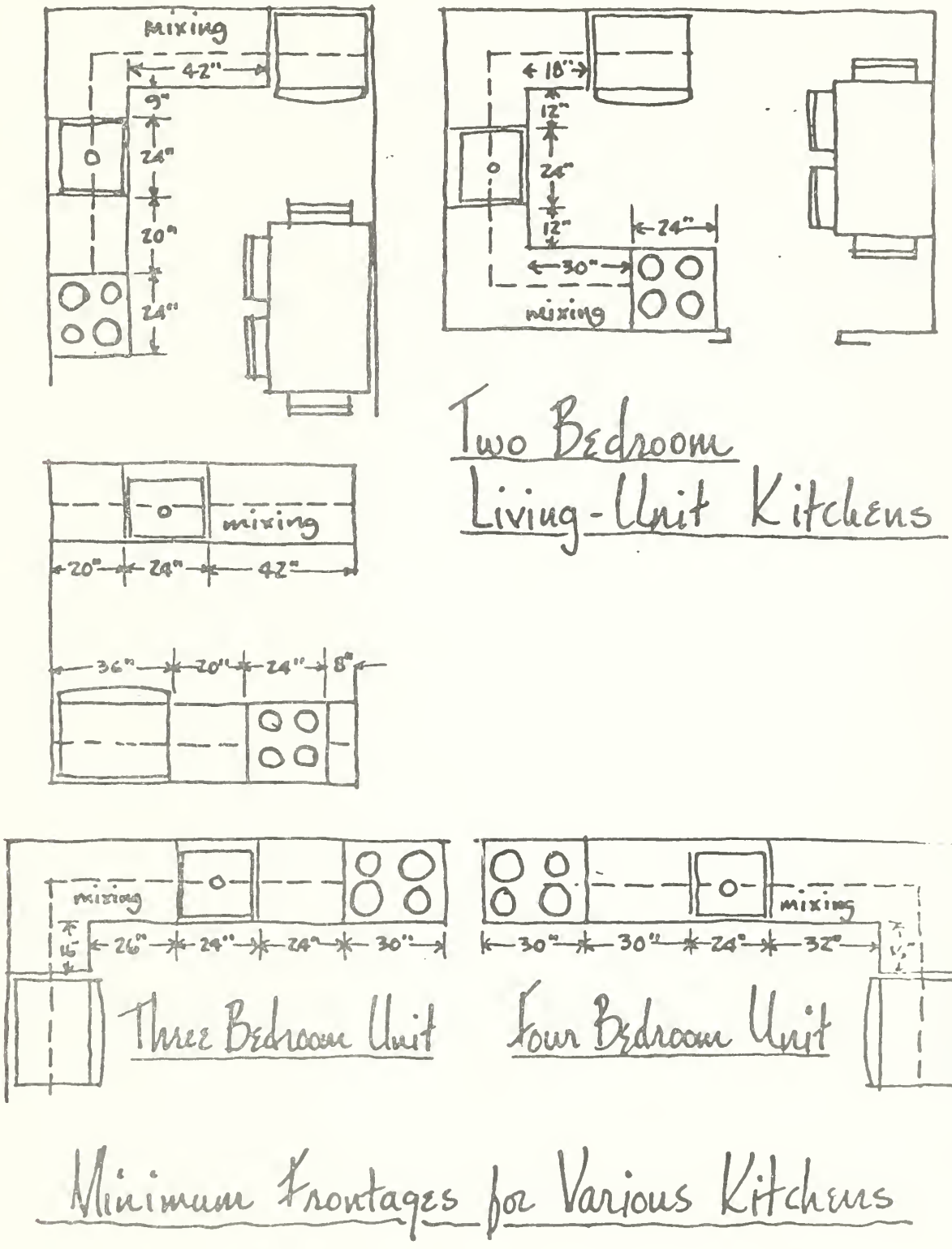


One Bedroom Kitchenette

Minimum Frontages and Edge Distances- Kitchens

Figure 3-7

GUIDES



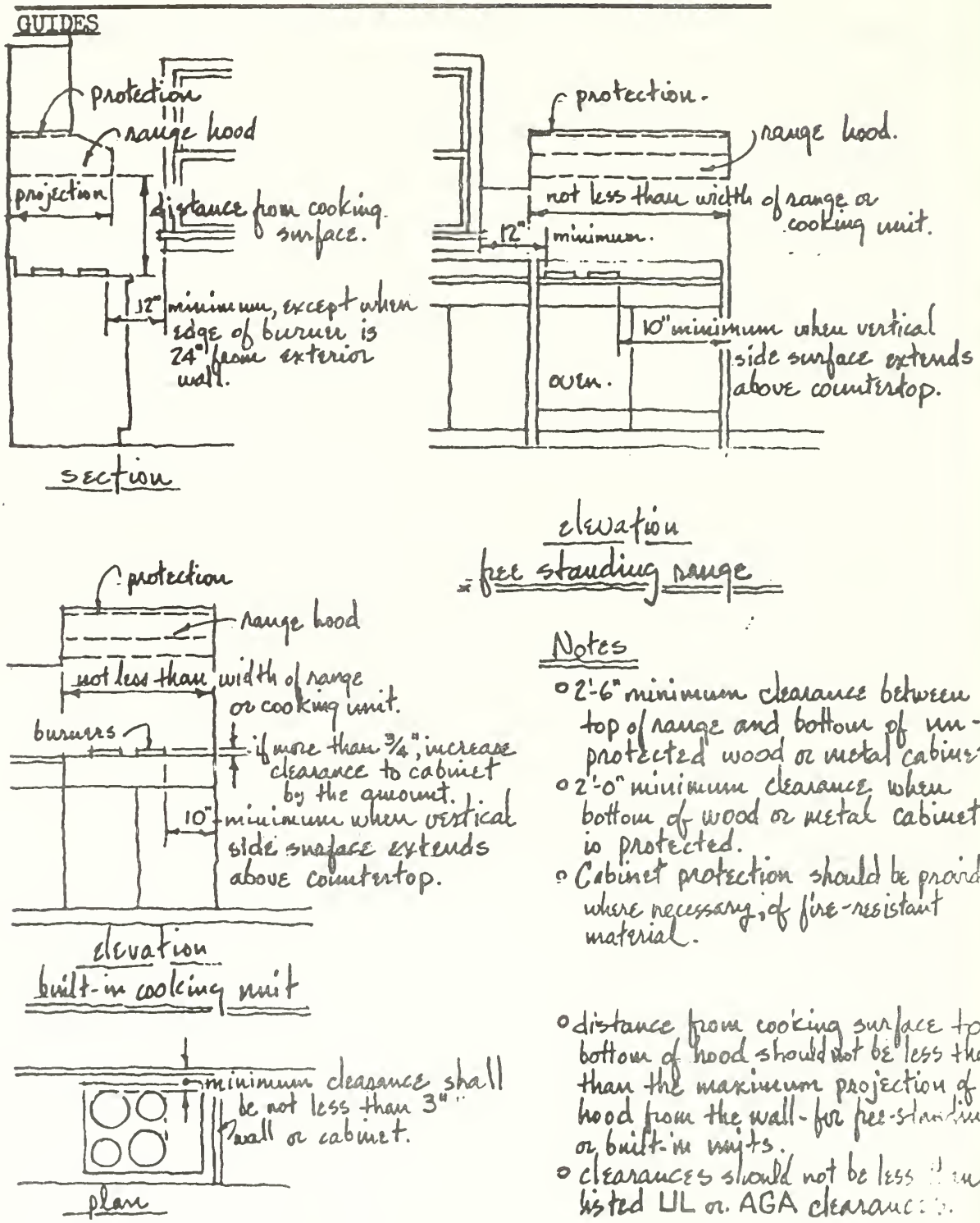
Two Bedroom Living-Unit Kitchens

Three Bedroom Unit

Four Bedroom Unit

Minimum Frontages for Various Kitchens

Figure 3-8


GUIDES
protection
range hood
projection
distance from cooking surface.
12" minimum, except when edge of burner is 24" from exterior wall.
section
protection.
range hood.
not less than width of range or cooking unit.
12" minimum.
10" minimum when vertical side surface extends above countertop.
oven.
elevation
free standing range
protection
range hood
not less than width of range or cooking unit.
burners
if more than 3/4", increase clearance to cabinet by the amount.
10" minimum when vertical side surface extends above countertop.
elevation
built-in cooking unit
minimum clearance shall be not less than 3" wall or cabinet.
plan

Notes

- 2'-6" minimum clearance between top of range and bottom of unprotected wood or metal cabinet.
- 2'-0" minimum clearance when bottom of wood or metal cabinet is protected.
- Cabinet protection should be provided where necessary, of fire-resistant material.
- distance from cooking surface to bottom of hood should not be less than the maximum projection of hood from the wall - for free-standing or built-in units.
- clearances should not be less than listed UL or AGA clearances.

Clearances at Cooking Units & Ranges

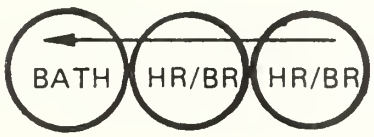
BATHROOM CHECKLIST

Each dwelling unit shall have a bathroom with enough area to accommodate a lavatory, a water closet, and a bathtub or shower. Arrangement for fixtures shall provide for comfortable use of each fixture and permit at least a 90-degree door swing unless sliding doors are used.

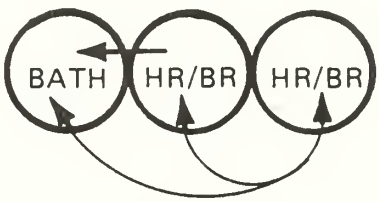
A required bathroom shall
- not open directly into a kitchen
- be convenient to the bedroom zone
- be accessible from the living and work areas

The ONLY access from a habitable room / bedroom to a bathroom CANNOT be through another habitable room / bedroom.

Not Acceptable

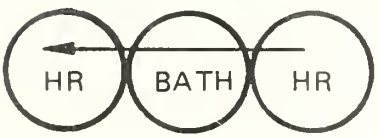


Acceptable

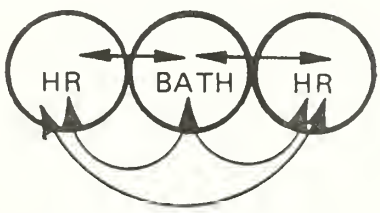


The ONLY access from one habitable room to another habitable room CANNOT be through a bathroom.

Not Acceptable



Acceptable



Linen storage should be accessible from the bathroom but not located within the bathroom.

Each complete bathroom should be provided with the following:

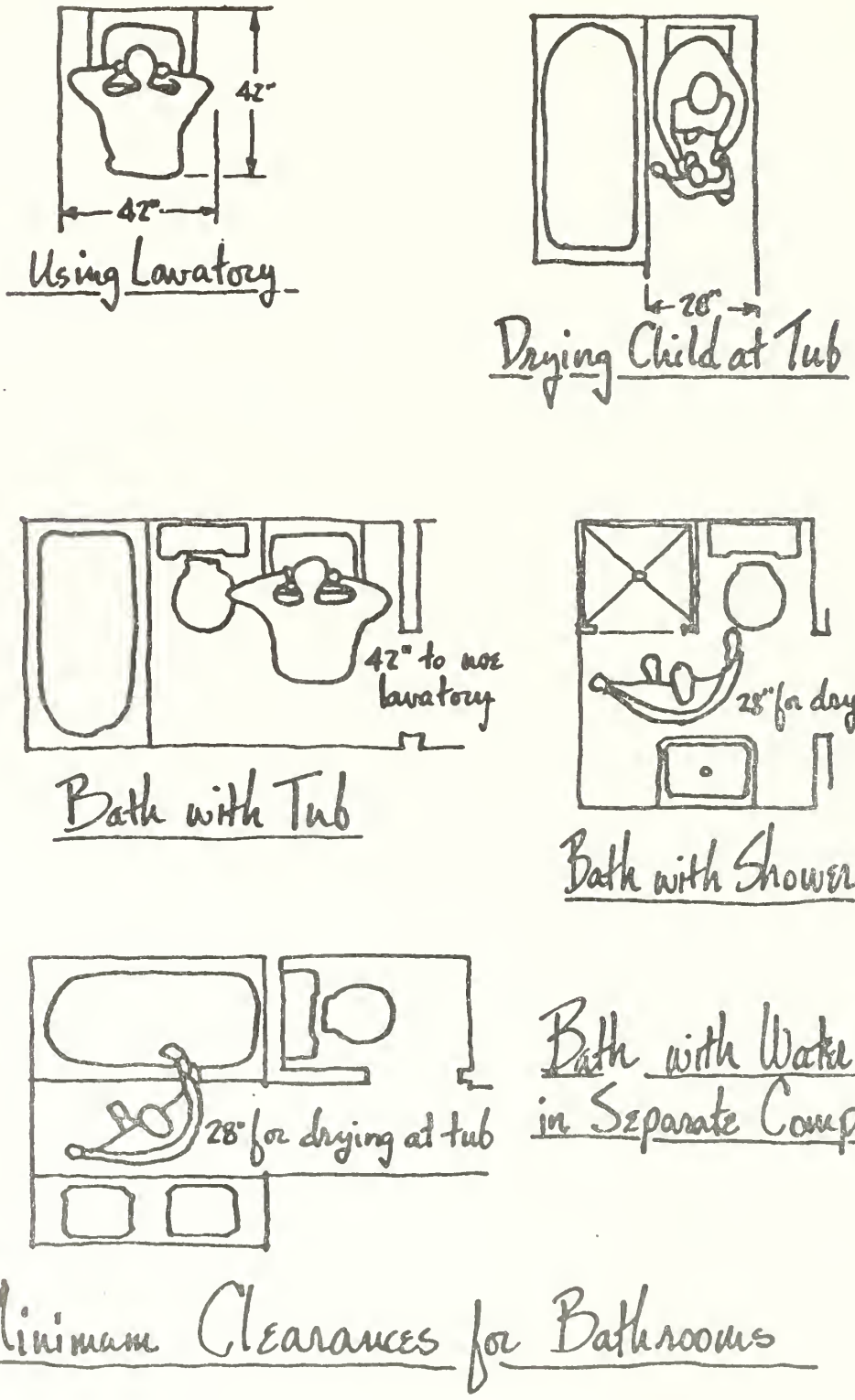
grab bar and soap dish at bathtub
toilet paper holder at water closet*
soap dish at lavatory (may be integral with lavatory)*
towel bar*
mirror and medicine cabinet or equivalent enclosed shelf space*
In all cases where shower head is installed, provide a shower rod or shower door.

---

*Each half-bath should be provided with these items.

Figure 3-9

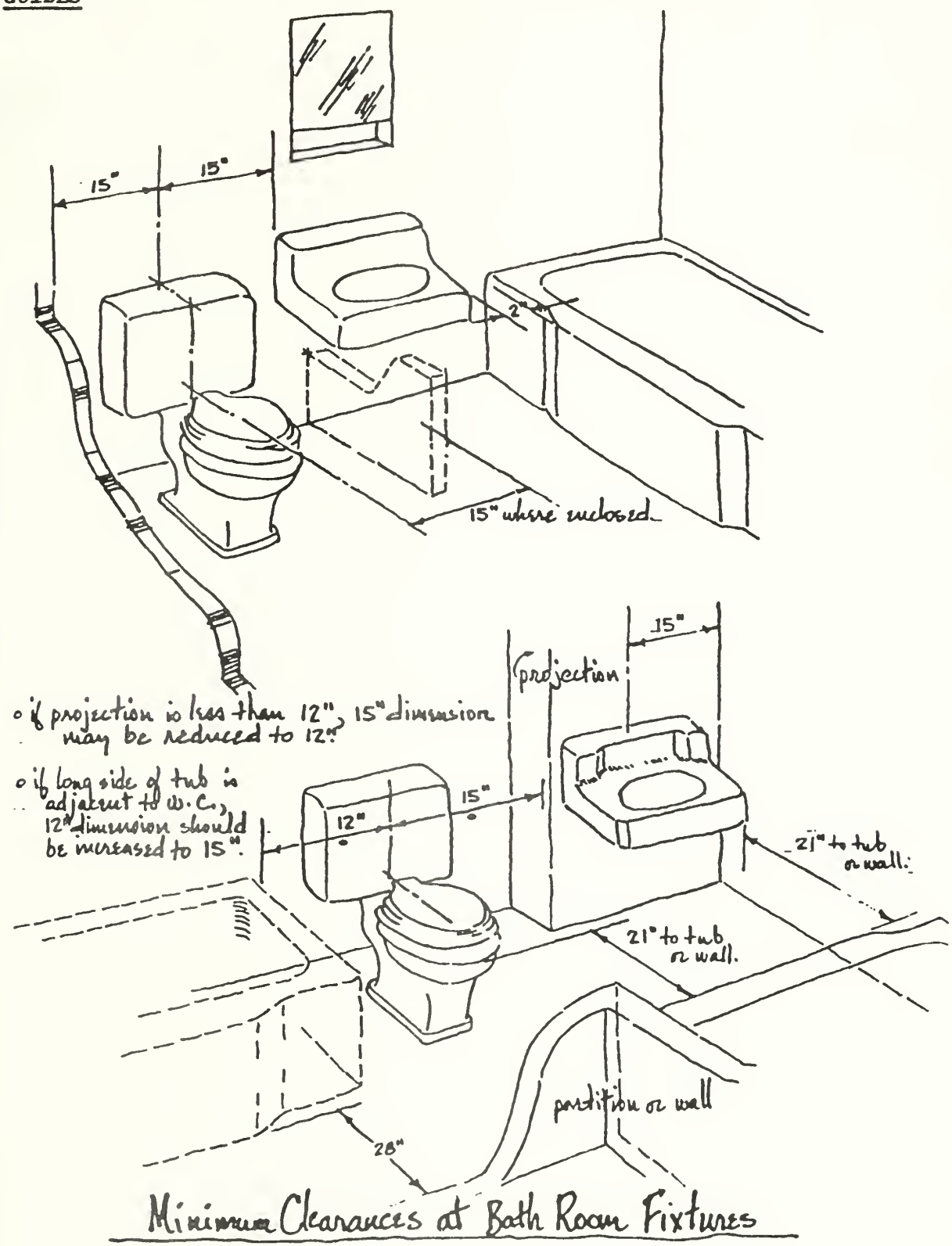
GUIDES



Minimum Clearances for Bathrooms

Figure 3-10

GUIDES



Minimum Clearances at Bath Room Fixtures

BEDROOM CHECKLIST

Each dwelling unit shall have space(s) allocated to sleeping and such related activities as dressing and personal care and study or reading. Sufficient space shall also be provided for clothes storage and housekeeping in the bedroom areas.

Although the required area in a primary bedroom varies depending upon the given room layout, adequate space shall be provided to permit comfortable use of essential furniture and circulation as follows:

*2 - twin beds (3'-3" x 6'-10"
1 - dresser (1'-6" x 4'-4")
1 - chair (1'-6" x 1'-6")
1 - crib (2'-6" x 4'-6")
**1 - table (1'-6" x 2'-6") for sewing or other work

A secondary double-occupancy bedroom shall have space to facilitate circulation and accommodate the following sized furniture:

*2 - twin beds (3'-3" x 6'-10") or 1 double bed (4'-6" x 6'-10")
1 or 2** - dresser(s) (1'-6" x 3'-6")
1 - chair (1'-6" x 1'-6")
1 - desk (1'-8" x 3'-6") or storage chest for toys

A secondary single-occupancy bedroom shall have space to facilitate circulation and accommodate the following sized furniture:

1 - twin bed (3'-3" x 6'-10")
1 - dresser (1'-6" x 3'-6"
1 - chair (1'-6" x 1'-6")
**1 - desk (1'-8" x 3'-6")

Dormitory type sleeping spaces shall accommodate the required number of beds (not bunks) and other necessary furniture and have appropriate closet space.

Each bedroom shall have proper provisions for natural light and ventilation.

---

*Provision of space for two (2) twin beds with required circulation space between will ensure adequate space for any bed up to king size.

**Desirable additional furniture

Visual and auditory privacy is needed in all bedrooms.*

Safety provisions regarding a second means of egress shall be in accordance with the latest edition of the applicable CABO One and Two Family Dwelling Code or the Uniform Building Code.

Clearances

For reasonable access to and use of the bedroom furniture and equipment, the following minimum clearances should be observed:

42" at one side or foot of bed, for dressing

12" clearance for least-used side of double bed or pair of twin beds; the least-used side of a single bed may be placed against wall

6" clearance from side of bed to side of dresser or chest

36" clearance in front of dresser, closet, or chest of drawers

24" clearance for major circulation path (door to closet, etc.)

22" clearance on one side of twin bed

It should not be necessary to move double beds to make them up.

Bedrooms should be of sufficient size to permit an alternate arrangement of furniture if at all possible.

Primary bedrooms should have at least one uninterrupted wall space of at least 10 feet. There should also be space provided for private working or resting separate from dressing spaces.

Location

The bedroom or sleeping area of the living unit should be away from the living and working areas for privacy.

---

*Source: "A Guide to Airborne, Impact, and Structureborne Noise Control in Multifamily Dwellings," HUD-TS-24, 1974 (see "Reference" section).

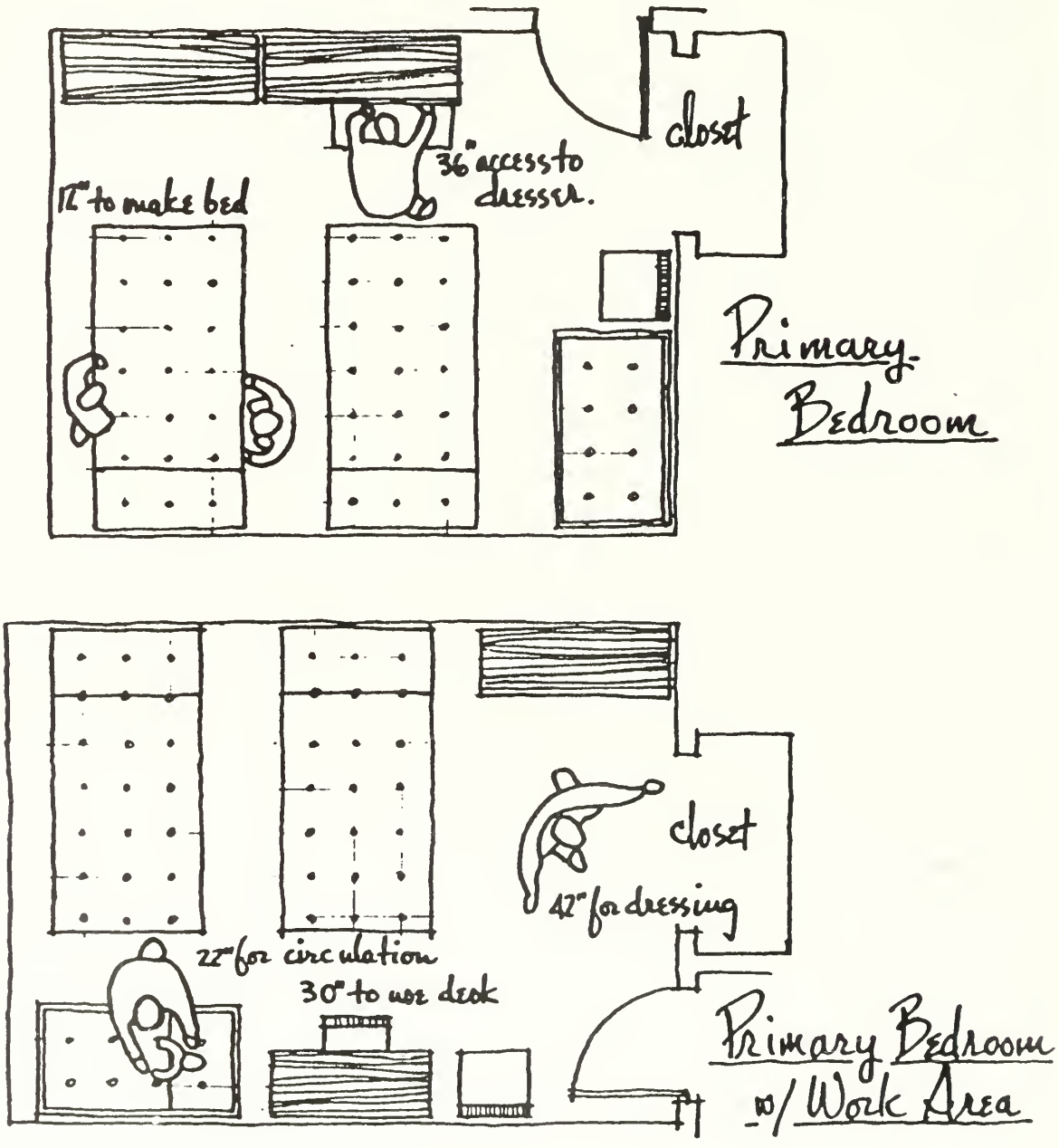
In the analysis of the bedroom area, there should be a regard for the makeup of the family. With preschool children, it is convenient if the master bedroom is close to children's bedrooms. With teenage children, separation of the master bedroom from other bedrooms is desirable wherever possible to reduce noise.

The location of doors, windows, and closets should be planned to allow the best placement of the bed and other furniture.

Placement of the closet so it is next to the door into the bedroom minimizes the use of wall space.

Figure 3-11

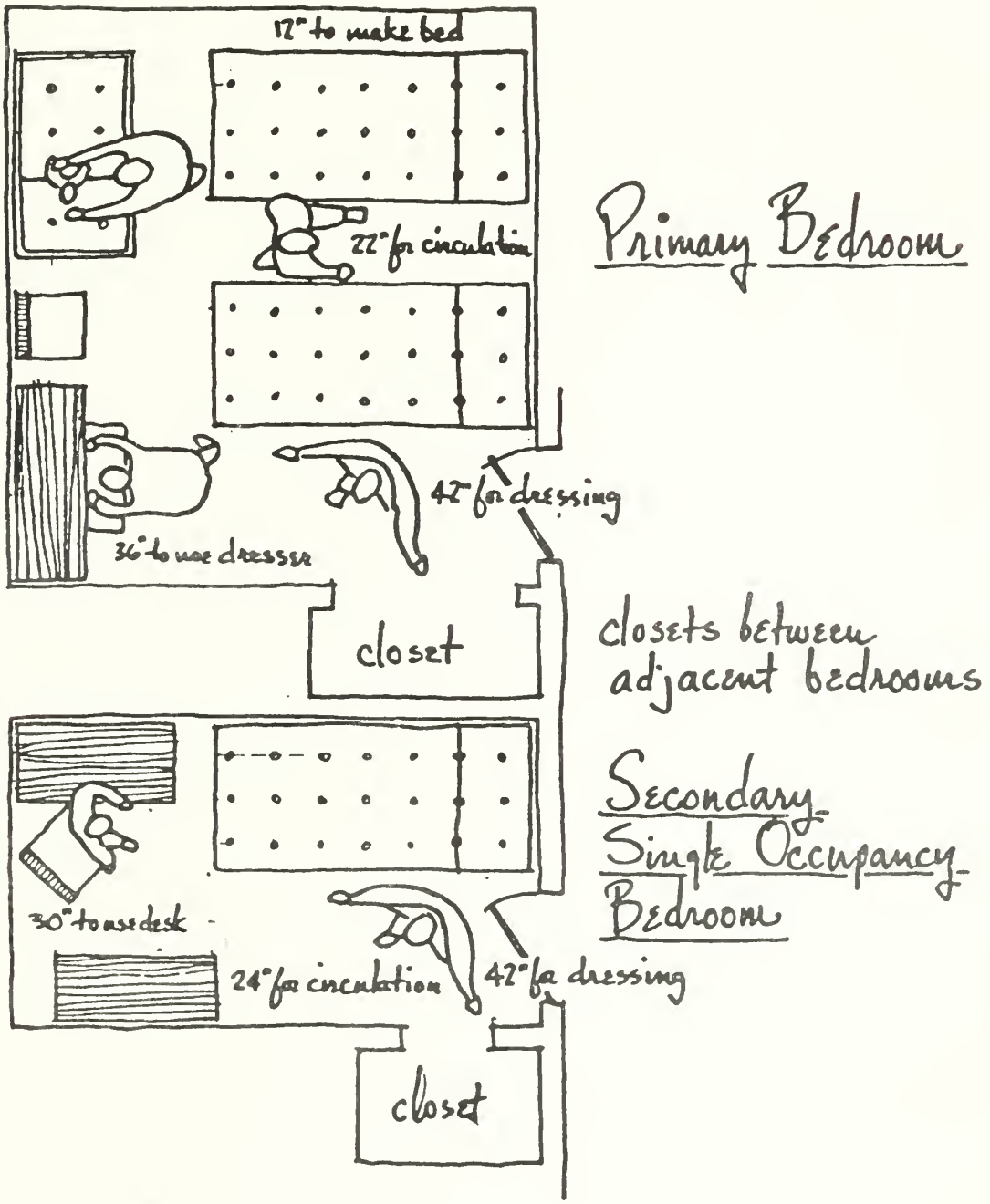
GUIDES



Minimum Clearances in Primary Bedrooms

Figure 3-12

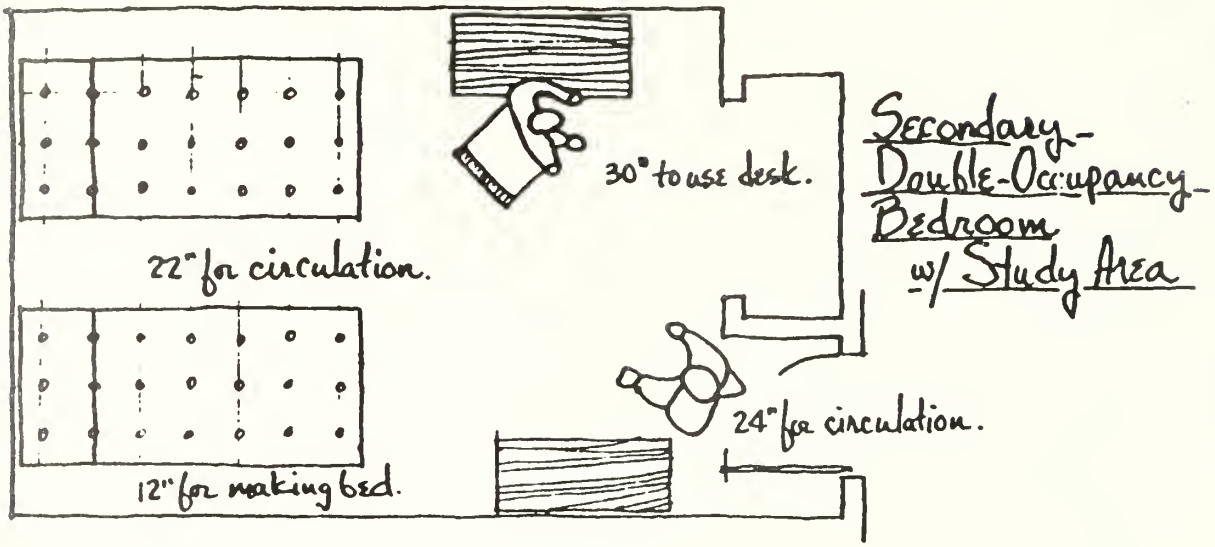
GUIDES

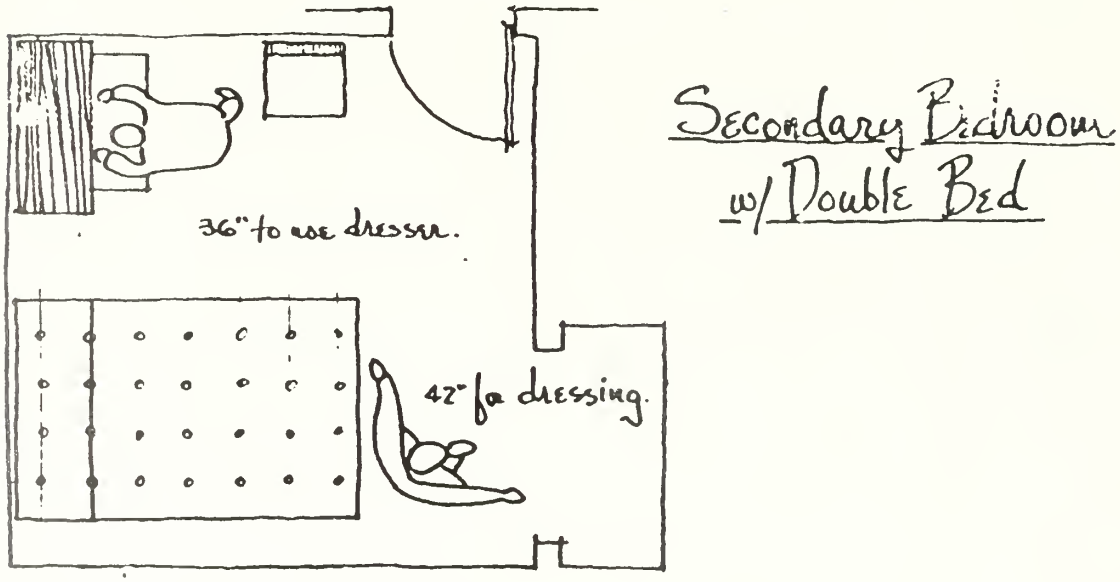


Minimum Clearances in Primary and Secondary Bedrooms

Figure 3-13

GUIDES





Minimum Clearances in Secondary Bedrooms

CLOSETS AND STORAGE CHECKLIST

Sufficient closets and storage space shall be provided for living and housekeeping within each living unit. All closets and storage spaces shall be appropriately located in relation to their principal uses.

Bedroom Closets

Each bedroom shall have at least one closet for clothes hanging and storage that meets or exceeds the following:

Depth - 2 feet, clear (minimum)
Length - 4-6 linear feet single occupancy
8-12 linear feet double occupancy

Each bedroom closet shall have a shelf and hanging pole.

In seasonal employee housing, consider built-in drawers and shelves to minimize need for dressers and other furniture.

Coat Closet

Each living unit shall have an appropriately sized coat closet near the entrance of the unit.

Linen Closet

Provide a suitable linen closet for each living unit that is accessible to the bedroom and bathroom area. Shelves shall be provided, but drawers may be substituted for a portion of the shelf space. Shelves should be 12"-18" deep.

General Storage

Usable general storage space shall be provided for each living unit in at least the following amounts:

Storage entirely within the living unit

0 bedroom and 1 bedroom	= 80 cu. ft.
2 bedrooms	= 112 cu. ft.
3 bedrooms	= 144 cu. ft.
4 bedrooms	= 176 cu. ft.

Where at least a minimum of one-third of the storage space is within the unit, provide the following total storage:

0 bedroom and 1 bedroom	= 120 cu. ft.
2 bedrooms	= 168 cu. ft.
3 bedrooms	= 216 cu. ft.
4 bedrooms	= 264 cu. ft.

Interior general storage may be in bedroom or coat closets when these closets are larger than the required space as shown above.

Location

In bedrooms, the placement of the closet so that it is next to the door into the bedroom minimizes the use of valuable wall space for furniture.

Closets should be used between bedrooms and the living-working zones and between individual bedrooms, wherever possible, to enhance privacy.

Clearances and Sizes

Adequate floor space should be provided in front of closet openings to permit easy access.

Walk-in closets should have a minimum of 1'-6" in front of the clothes and 1'-8" between two racks of clothes.

If a closet is 2'-0" deep, only 6" of the rod that is concealed by the door jamb on each side of the door should be considered accessible. If provision is made for 6" clearance in front of the clothes up to 12" of rod concealed by the jamb is accessible.

If a hookstrip for clothes hanging is to be provided in addition to the shelf and pole, the space should have a clear depth of 2'-6".

Hanging pole length may be determined by the allowances for the following minimums:

3" per hanger for men's suits
2" per hanger for women's clothing
4" per hanger for heavy coats
1½" per hanger for shirts

Ventilation

Provision should be made for ventilating clothes and storage spaces.

Broom Closet

General storage space should be provided for cleaning equipment; it does not have to be a separate closet.

Coat Closet

The coat closet size for living units with as many as two bedrooms should be at least 3 feet in length and 2 feet deep, and appropriately increased for larger units.

In basementless single-family and duplex houses, at least 50 cu. ft. per bedroom of external enclosed storage area should be provided for articles and equipment used outdoors.

LAUNDRY CHECKLIST

General

Where central laundry facilities are not provided, each living unit shall contain water and waste piping and space for a washing machine and space and venting for a clothes dryer.

Location

The laundry location in a utility room or bathroom is preferable to provide more noise control, improved sanitation, and less disruption to the living spaces of the dwelling unit.

Laundry Space Allowances

1 - utility sink, 24" frontage x 20"
1 - clothes washer, 30" frontage x 30"
1 - clothes dryer, 30" frontage x 30"

SEASONAL EMPLOYEES

LIVING UNIT TYPE

- Dorms with one person per room considered desirable/necessary by the majority of respondants. Employees from Alaskan and Gulf Coast parks were less enthusiastic about dorm arrangements.

- Bunkhouses (more than one person/room) viewed as not desirable.

- Apartments (efficiency and 2-3 bedroom).were viewed favorably.

- Cabins were viewed favorably.

- Shared houses viewed with marginal preference servicewide but favored by respondants from the northwest coast area.

PRIVACY PRIORITY

1) sleeping area
2) toilet and sink area
3) shower or bathing area
4) kitchen area
5) living area

OUTDOOR LIVING AREA

- Screened porch is favored, followed by deck, open porch, and patio.

LIVING ROOM

- Should have best scenic view.

INDOOR STORAGE

- Extra storage area should be provided for bulk household supplies and clothing.

OUTDOOR STORAGE

- Storage areas should be provided for professional equipment (especially desired by Alaska and Bayou coast respondants), personal tools (gardening and auto repair), and bicycles.

- Area for parking second car or truck was viewed with marginal preference.

AMENITIES--ITEMS THAT SHOULD BE PROVIDED

picnic tables
laundry rooms
clotheslines
workout/exercise equipment
cleared recreation field
recreation center (especially favored by respondants from Alaska and West Texas park areas)

AMENITIES--ITEMS THAT SHOULD BE CONSIDERED

microwave oven
children's playground
hard-surface playing courts (less desirable to respondants from southwest coast and north climate areas)

NATIONAL PARK SERVICE

HOUSING DESIGN QUESTIONNAIRE FOR SEASONAL EMPLOYEES

JANUARY 1988

Housing Oversight Committee is considering the following features as they prepare the
ign Standards for National Park Service housing. Darken the one oval per question on the
arate answer sheet that best reflects your preference for each feature. * **PLEASE READ THE
-PAGE INSTRUCTION SHEET BEFORE YOU BEGIN.**

ERAL INFORMATION

E: Please provide 4-digit org code
er Occupational Group Number on the
wer sheet.

Have you ever lived in park housing?
A. Yes 91%
B. No 9%

Indicate the number of years you have lived in park housing.
A. Under 2 years 32%
B. 2-6 years 35%
C. 7-12 years 17%
D. 13-19 years 7%
E. Greater than 20 years ...5%

Indicate the number of adults in household.
A. One 40%
B. Two 45%
C. Three 6%
D. Four 3%
E. More than 4 .. 4%

Indicate the number of children in household under the age of 18.
A. One 14%
B. Two 10%
C. Three 2%
D. Four 1%
E. More than 4 .. 0%

Indicate the age of your youngest child.
A. 4 years old or younger ... 11%
B. 5-9 years old 6%
C. 10-14 years old 4%
D. 15-17 years old 3%
E. 18 years or older 7%

6. Indicate the age of your oldest child.
   A. 4 years old or younger ... 7%
   B. 5-9 years old 6%
   C. 10-14 years old 4%
   D. 15-17 years old 4%
   E. 18 years or older 11%

7. Indicate the number of years you have worked for the National Park Service (include all types of appointments).
   A. Under 2 years 24%
   B. 2-6 years 39%
   C. 7-12 years 21%
   D. 13-19 years 8%
   E. Greater than 20 years 7%

8. Do you have a copy of NPS-36, Government-Furnished Housing Managemer Guideline?
   A. Yes 33%
   B. No 67%

9. Have you read NPS-36?
   A. Yes 35%
   B. No 65%

10. Have you read your park area's Housing Management Plan?
    A. Yes 29%
    B. No 70%

For questions 10-37 indicate whether the design feature listed is:

A. NECESSARY - This design feature is absolutely needed or required in park housing.
B. DESIRABLE - This design feature is advantageous or beneficial in park housing.
C. NOT DESIRABLE - This design feature is not necessary in park housing.

Indicate your preference for living style unit.

11. Dorms (one person per room)
A. Necesry. B. Desirbl. C. Not Desirbl.
33% 32% 34%

12. Bunkhouses (more than one person per room)
A. Necesry. B. Desirbl. C. Not Desirbl.
8% 14% 76%

13. Efficiency apartments
A. Necesry. B. Desirbl. C. Not Desirbl.
39% 46% 12%

14. 2-3 bedroom apartments
A. Necesry. B. Desirbl. C. Not Desirbl.
36% 48% 14%

15. Shared houses
A. Necesry. B. Desirbl. C. Not Desirbl.
18% 42% 38%

16. Cabins
A. Necesry. B. Desirbl. C. Not Desirbl.
32% 51% 16%

If seasonal living arrangements could be made more private and allowed for less shared housing, indicate the importance of privacy for each of the following living areas.

17. Shower or bathing area
A. Necesry. B. Desirbl. C. Not Desirbl.
57% 33% 10%

18. Toilet and sink area
A. Necesry. B. Desirbl. C. Not Desirbl.
61% 34% 5%

19. Sleeping area
A. Necesry. B. Desirbl. C. Not Desirbl.
84% 16% 0%

20. Kitchen area
A. Necesry. B. Desirbl. C. Not Desirbl.
30% 51% 20%

21. Living area
A. Necesry. B. Desirbl. C. Not Desirbl.
22% 51% 26%

INDOOR STORAGE

Indicate whether more indoor storage space than you now find in park housing is: NECESSARY, DESIRABLE or NOT DESIRABLE.

22. Extra storage area designed to accommodate bulk household supplies
A. Necesry. B. Desirbl. C. Not Desirb
46% 44% 10%

23. Extra storage area designed for storag of clothing
A. Necesry. B. Desirbl. C. Not Desirb
42% 44% 13%

OUTDOOR STORAGE

Indicate whether more outdoor storage spac than you now find in park housing is: NECESSARY, DESIRABLE or NOT DESIRABLE.

24. Storage area designed for personal too (auto repair, gardening, etc.)
A. Necesry. B. Desirbl. C. Not Desirb
24% 47% 21%

25. Storage area designed for professiona equipment
(scuba, backcountry, EMT)
A. Necesry. B. Desirbl. C. Not Desirb
36% 48% 14%

26. Storage area designed for second car truck
A. Necesry. B. Desirbl. C. Not Desirb
14% 42% 41%

27. Storage area designed for bicycles
A. Necesry. B. Desirbl. C. Not Desirb
28% 52% 16%

Indicate the importance of the park providing the following:

28. Picnic Tables
A. Necesry. B. Desirbl. C. Not Desirbl.
36% 51% 8%

29. Clothesline
A. Necesry. B. Desirbl. C. Not Desirbl.
36% 43% 13%

30. Laundry rooms
A. Necesry. B. Desirbl. C. Not Desirbl.
79% 17% 2%

31. Microwave oven
A. Necesry. B. Desirbl. C. Not Desirbl.
11% 51% 35%

32. Fenced (recreational/play) yard
A. Necesry. B. Desirbl. C. Not Desirbl.
12% 42% 43%

33. Cleared field for softball or other recreation
A. Necesry. B. Desirbl. C. Not Desirbl.
24% 52% 21%

34. Children's playground or tot lots
A. Necesry. B. Desirbl. C. Not Desirbl.
22% 49% 25%

35. Recreation Center (communal workshop, T.V., pool tables)
A. Necesry. B. Desirbl. C. Not Desir
28% 50% 19%

36. Work-out/exercise equipment
A. Necesry. B. Desirbl. C. Not Desir
36% 46% 14%

37. Hard-surface playing courts
A. Necesry. B. Desirbl. C. Not Desir
14% 50% 33%

38. Of the following features which one d you consider most important for you i park housing?
A. Open porch 19%
B. Screened porch 35%
C. Deck 21%
D. Patio 14%

39. Of the rooms listed below which one should have the best scenic view?
A. Kitchen 3%
B. Eating space 16%
C. Living space 66%
D. Bedroom 3%
E. Other 2%

PERMANENT EMPLOYEES

MAIN ENTRYWAY

- Vestibule/airlock entrance favored; essential for Alaska.
- Coat closet should be adjacent to entryway, especially for the more northern climates.

LIVING ROOM

- Should be a separate room from primary eating area.
- Should be the room with the most scenic view.

DINING ROOM (primary eating area)

- More area should be provided for this function.
- Keep as separate area from kitchen and living room.

RECREATION/FAMILY ROOM

- More area should be provided for this function.

MASTER BEDROOM

- More area should be provided for this function.
- Should be physically remote from other bedrooms.
- Should include a master bath (either 3/4 or full bath).

KITCHEN

- More area should be provided for this function.
- Should not include the primary eating area.
- Extra counter space should be allowed for microwave oven.
- Space for dishwasher and second refrigerator or separate freezer is favored.

- Extra storage should be provided for kitchen equipment, dish storage, and one month's supply of food.

BATH

- 1½ bath for 2-bedroom single-family residence
- 1-3/4 bath for 3-bedroom single-family residence
- 2 baths for 4-bedroom single-family residence
- 3/4 or full bath as a master bath

LAUNDRY AREA

- Preferred location is in an ample sized utility/laundry room on the main living level.

- Utility sink should be provided.

OUTDOOR LIVING AREA

- Screened porch is favored for most climate zones.

- Respondants from west coast, northeast, and mountain climates preferred decks/patios.

INDOOR STORAGE

- Extra storage area should be considered for bulk household supplies, off-season clothing/linens/blankets, and toys/games.

OUTDOOR STORAGE

- Provide storage area for personal tools (auto repair, gardening, etc.), firewood, and bicycles.

- Consider storage space for recreational/hobby equipment, professional gear, and second vehicles and recreational vehicles.

RECREATION/COMMUNITY FACILITIES

- Provide fenced play yard, children's playground, and workout/exercise equipment.

- Consider communal recreation facility, cleared recreation field, private garden areas, and hard-surface playing courts.

NATIONAL PARK SERVICE

HOUSING DESIGN QUESTIONNAIRE FOR PERMANENT EMPLOYEES

JANUARY 1988

ıe Housing Oversight Committee is considering the following features as they prepare the
:sign Standards for National Park Service housing. Darken the one oval per question on t
:parate answer sheet that best reflects your preference for each feature. * **PLEASE READ T**
IE-PAGE INSTRUCTION SHEET BEFORE YOU BEGIN.

:NERAL INFORMATION

lease provide 4-digit org code under
:cupational Group Number on the
ıswer sheet.

. Have you ever lived in park housing?
A. Yes 87%
B. No

. Indicate the number of years you have lived in park housing.
A. Under 2 years 17%
B. 2-6 years 29%
C. 7-12 years 26%
D. 13-19 years 14.5%
E. Greater than 20 years 6.5%

. Indicate the number of adults in household.
A. One 26%
B. Two 67%
C. Three 3%
D. Four 2%
E. More than 4 .... 1%

. Indicate the number of children in household under the age of 18.
A. One 20%
B. Two 20%
C. Three 7%
D. Four 2%
E. More than 4 ..... 1%

. Indicate the age of your youngest child.
A. 4 years old or younger ... 20%
B. 5-9 years old 11%
C. 10-14 years old 10%
D. 15-17 years old 6%
E. 18 years or older 8%

6. Indicate the age of your oldest chil
A. 4 years old or younger ... 10%
B. 5-9 years old 10%
C. 10-14 years old 11%
D. 15-17 years old 8%
E. 18 years or older 16%

7. Indicate the number of years you hav worked for the National Park Service (include all types of appointments).
A. Under 2 years ... 6%
B. 2-6 years 19%
C. 7-12 years 33%
D. 13-19 years 26%
E. Greater than 20 years ... 16%

8. Do you have a copy of NPS-36, Government-Furnished Housing Managem Guideline?
A. Yes 63%
B. No 36%

9. Have you read NPS-36?
A. Yes 55%
B. No 44%

10. Have you read your park area's Housing Management Plan?
A. Yes 48%
B. No 51%

ROOM SIZE

OMB Circular A-18 limits the total square footage of a housing unit. Please indicate for the following rooms whether the rooms should be designed larger or smaller compared to what you now find in park housing, or are they adequate size.

11. Master Bedroom
    A. Larger 55%
    B. Smaller 1%
    C. Adequate 41%

12. Living Room
    A. Larger 42%
    B. Smaller 2%
    C. Adequate 53%

13. Recreation/Family Room
    A. Larger 52%
    B. Smaller 1%
    C. Adequate 29%

14. Kitchen
    A. Larger 57%
    B. Smaller 1%
    C. Adequate 40%

15. Dining Room/Eating area
    A. Larger 50%
    B. Smaller 2%
    C. Adequate 44%

16. Hallway
    A. Larger 18%
    B. Smaller 3%
    C. Adequate 75%

17. Laundry Room
    A. Larger 47%
    B. Smaller 1%
    C. Adequate 45%

LIVING SPACE

Indicate your preference for the relationship of the following rooms:

18. Should the master bedroom be physically remote from other bedrooms?
    A. Yes 71%
    B. No 27%

19. Would you prefer the kitchen and the primary eating area to be:
    A. Separate rooms 58%
    B. The same room 41%

20. Would you prefer the primary eating area and the living room space to be:
    A. Separate rooms 84%
    B. The same room 14%

21. Which room should have the best scenic view?
    A. Kitchen 5%
    B. Eating space 10%
    C. Living space 83%
    D. Bedroom 1%
    E. Other 1%

UTILITY AREA

22. Would you prefer a separate laundry room?
    A. Yes 92%
    B. No 8%

23. If you answered "Yes" to number 22, on what floor do you prefer the laundry room to be located in a 2-story house
    A. First floor 59%
    B. Second floor 6%
    C. Basement 28%

24. If you answered "No" to number 22, wh is the most desirable location for th laundry area?
    A. Kitchen 5%
    B. Basement 5%
    C. Garage 1%
    D. Bathroom 1%
    E. Utility room 12%

25. Should the laundry area have a utilit sink?
    A. Yes 86%
    B. No 12%

26. Of the following features which one d you consider most important for you i park housing?
    A. Open porch 12%
    B. Screened porch 41%
    C. Deck 21%
    D. Patio 25%

BATH ROOM

Indicate the size bathroom you would consider adequate for each housing unit size.

half bath = lavatory and commode
3/4 bath = lavatory, commode and shower
full bath = lavatory, commode and tub

27. Two-bedroom single family house
    A. Full bath 30%
    B. One and one-half baths 35%
    C. One and three-fourths 25%
    D. Two full baths 7%
    E. Two and one-half baths 1%

28. Three-bedroom single family house
    A. Full bath 3%
    B. One and one-half baths 3%
    C. One and three-fourths 44%
    D. Two full baths 29%
    E. Two and one-half baths 6%

29. Four-bedroom single family house
    A. Full bath 1%
    B. One and one-half baths 3%
    C. One and three-fourths 22%
    D. Two full baths 41%
    E. Two and one-half baths 31%

30. Is a bathroom attached to the master bedroom essential?
    A. Yes 57%
    B. No 41%

31. If master bedroom has an attached bath, what size bath would you prefer?
    A. 3/4 bath (with shower) 49%
    B. Full bath (with tub) 49%

For questions 32-58 indicate whether the design feature listed is:

A. NECESSARY - This design feature is absolutely needed or required in park housing.
B. DESIRABLE - This design feature is advantageous or beneficial in park housing.
C. NOT DESIRABLE - This design feature is not necessary in park housing.

INDOOR STORAGE

Indicate whether more indoor storage space than you now find in park housing is: NECESSARY, DESIRABLE or NOT DESIRABLE.

32. Extra storage to accommodate additional kitchen equipment and dishes that are n used daily
    A. Necesry. 45% B. Desirbl. 48% C. Not Desirbl 5%
33. Extra storage area to accommodate one month's supply of food
    A. Necesry. 47% B. Desirbl. 45% C. Not Desirbl 7%
34. Extra storage area to accommodate bulk household supplies
    A. Necesry. 51% B. Desirbl. 43% C. Not Desirbl 5%
35. Extra storage area for storage of clothing (off season/4 or more lineal f
    A. Necesry. 62% B. Desirbl. 33% C. Not Desirbl 3%
36. Extra storage area for off-season linen and blankets
    A. Necesry. 48% B. Desirbl. 45% C. Not Desirbl 5%
37. Extra indoor closet space designed for toys, games, etc.
    A. Necesry. 36% B. Desirbl. 54% C. Not Desirbl 8%

OUTDOOR STORAGE

Indicate for each feature whether more outdoor storage space than you now find in park housing is:
NECESSARY, DESIRABLE or NOT DESIRABLE

38. Storage area for recreation/hobby equipment
A. Necesry. 45% B. Desirbl. 47% C. Not Desirbl. 6%

39. Storage area for personal tools (auto repair, gardening, etc.)
A. Necesry. 62% B. Desirbl. 33% C. Not Desirbl. 4%

40. Storage area for professional equipment (scuba, backcountry, EMT)
A. Necesry. 39% B. Desirbl. 45% C. Not Desirbl. 14%

41. Storage area for second car or truck
A. Necesry. 32% B. Desirbl. 56% C. Not Desirbl. 11%

42. Storage area for motor vehicles (recreation)
A. Necesry. 14% B. Desirbl. 52% C. Not Desirbl. 31%

43. Storage area for bicycles
A. Necesry. 34% B. Desirbl. 55% C. Not Desirbl. 9%

44. Storage area for firewood
A. Necesry. 39% B. Desirbl. 46% C. Not Desirbl. 12%

45. Storage area for automobile tires
A. Necesry. 9% B. Desirbl. 44% C. Not Desirbl. 44%

FRONT ENTRY

46. Entry coat closet
A. Necesry. 56% B. Desirbl. 38% C. Not Desirbl. 5%

47. Entry vestibule or enclosed entrance
A. Necesry. 30% B. Desirbl. 56% C. Not Desirbl. 12%

KITCHEN DESIGN

Indicate for each feature whether more space than you now find in park housing is:
NECESSARY, DESIRABLE or NOT DESIRABLE

48. Kitchen to accommodate a dishwasher
A. Necesry. 39% B. Desirbl. 46% C. Not Desirbl. 13%

49. Extra kitchen space to accommodate a second refrigerator or separate freezer
A. Necesry. 30% B. Desirbl. 48% C. Not Desirbl. 20%

50. Extra kitchen space to accommodate a second oven
A. Necesry. 3% B. Desirbl. 24% C. Not Desirbl. 71%

51. Extra counter space to accommodate a microwave oven
A. Necesry. 61% B. Desirbl. 32% C. Not Desirbl. 5%

RECREATION/COMMUNITY AREA

If a recreation/community area is deemed appropriate, indicate the importance of each feature to you and your family.

52. Fenced recreation/play yard
A. Necesry. 34% B. Desirbl. 44% C. Not Desirbl. 19%

53. Private garden area
A. Necesry. 21% B. Desirbl. 65% C. Not Desirbl. 12%

54. Cleared field for softball or other recreation
A. Necesry. 22% B. Desirbl. 58% C. Not Desirbl. 17%

55. Children's playground or tot lots
A. Necesry. 32% B. Desirbl. 49% C. Not Desirbl. 16%

56. Recreation Center (communal workshop T.V., pool tables)
A. Necesry. 21% B. Desirbl. 54% C. Not Desirbl. 22%

57. Work-out/exercise equipment
A. Necesry. 33% B. Desirbl. 52% C. Not Desirbl. 13%

58. Hard-surface playing courts
A. Necesry. 16% B. Desirbl. 63% C. Not Desirbl. 18%

REGIONAL GUIDELINES FOR BUILDING PASSIVE ENERGY-CONSERVING HOMES*

In the past, regional architecture and city planning evolved from climatic conditions, cultural habits and taste, use of indigenous materials, social structure, tradition, and a myriad of other factors. In many instances, regional styles have failed to adapt to change, have become illogical in today's world, or have been corrupted or forgotten in our rush toward technology, systemization, and sameness. Many facets of regional styles are worthy of preserving or readapting through microclimate design. If fully understood and applied, it is inevitable that landscape and climatic influences will generate a regional character with a type of architecture and community plan that best suits a geographical area. When supplemented with our vast knowledge of technical methodology and materials, this regional approach, modified and refined to suit present and future lifestyles, should provide the most logical solutions to habitat and community design.

A building separates inside spaces from the outside environment with the primary purpose of creating comfortable conditions for the occupant. Mechanical systems are designed to provide heating and cooling whenever outside conditions make the inside spaces uncomfortable. One of the most effective ways to save energy in residential buildings is to build responsively to the outside climate and thereby reduce dependence on mechanical systems. Energy conservation involves building to isolate the interior of a home from an "alien" climate, and passive design involves opening the same interior to a "friendly" climate for natural conditioning.

To be more specific, temperature, humidity levels, wind speeds, and sunshine define the climatic environment in which a building must operate. In building design, construction, and use, protection from some of these climatic forces as well as advantageous use of other of these forces significantly reduces the energy demand for mechanical systems. In other words, depending on where you are, different climate conditions can be a liability or an asset to your home energy consumption. Energy-conscious design is dependent on regional variations in temperature, humidity, wind, and sun.

---

*Much of this information is summarized from "Regional Guidelines for Building Passive Energy Conserving Homes" (HUD).

ASSETS AND LIABILITIES

Climatic Liabilities

Climatic liabilities are those factors (of sun, wind, temperature, and humidity) that make your seasonal conditions worse. Isolating yourself from these climatic liabilities is the basis of energy conservation, reducing the heating and cooling demand on the house.

Temperatures can be a liability in both hot and cold climates especially if it is consistently too hot or consistently too cold.

Wind is a liability in cold climates because it carries away heat quicker than usual. Wind can also be a liability to comfort in hot dry climates when winds cause people to dehydrate and consequently overheat.

Moisture can be a liability if it comes in the form of humidity, causing such stickiness that one cannot evaporatively cool (cooling by sweating) in summer.

Sun is rarely a liability in cold climates but can be a significant problem in hot climates.

Climatic Assets

Climatic assets are those forces (of sun, wind, temperature, moisture) that make the seasonal conditions more comfortable. Opening up to the assets of climate is the basis of passive design and offers methods of replacing the fuel supply with nondepletable resources.

Diurnal temperature conditions are day-to-night temperature shifts (from daytime heating to nighttime cooling) that exist in very dry areas and at high elevations. A day-to-night temperature swing can be flattened by the use of heavy construction, to yield constant temperatures throughout the day.

Wind can be an asset in hot, humid climates to provide natural ventilation, allowing air conditioners to be shut off.

Sun can be an asset in cool and cold climates to provide passive heating, allowing heaters to shut off or heating loads to be reduced.

Even moisture can be an asset by evaporating in hot, dry climates to cool and humidify the air--a natural air-conditioning system.

All of these assets can be accommodated with simple design changes such as siting, orientation, wall construction, and window placement, as seen in the following sections. They can also become sophisticated heating and cooling systems for the passive home, requiring the understanding of some basic technologies that are outlined in this chapter.

With these definitions of basic conditions, climatic liabilities, and climatic assets, you can begin to define your climate for energy conscious design in a country of numerous climates.

Some of these assets and liabilities will be important to your climate and some will not. You must know whether you are designing for significant heating or cooling or both. You must then look at which climatic forces (sun, wind, temperature, humidity) make it worse, which forces make it better, and how frequent those forces are.

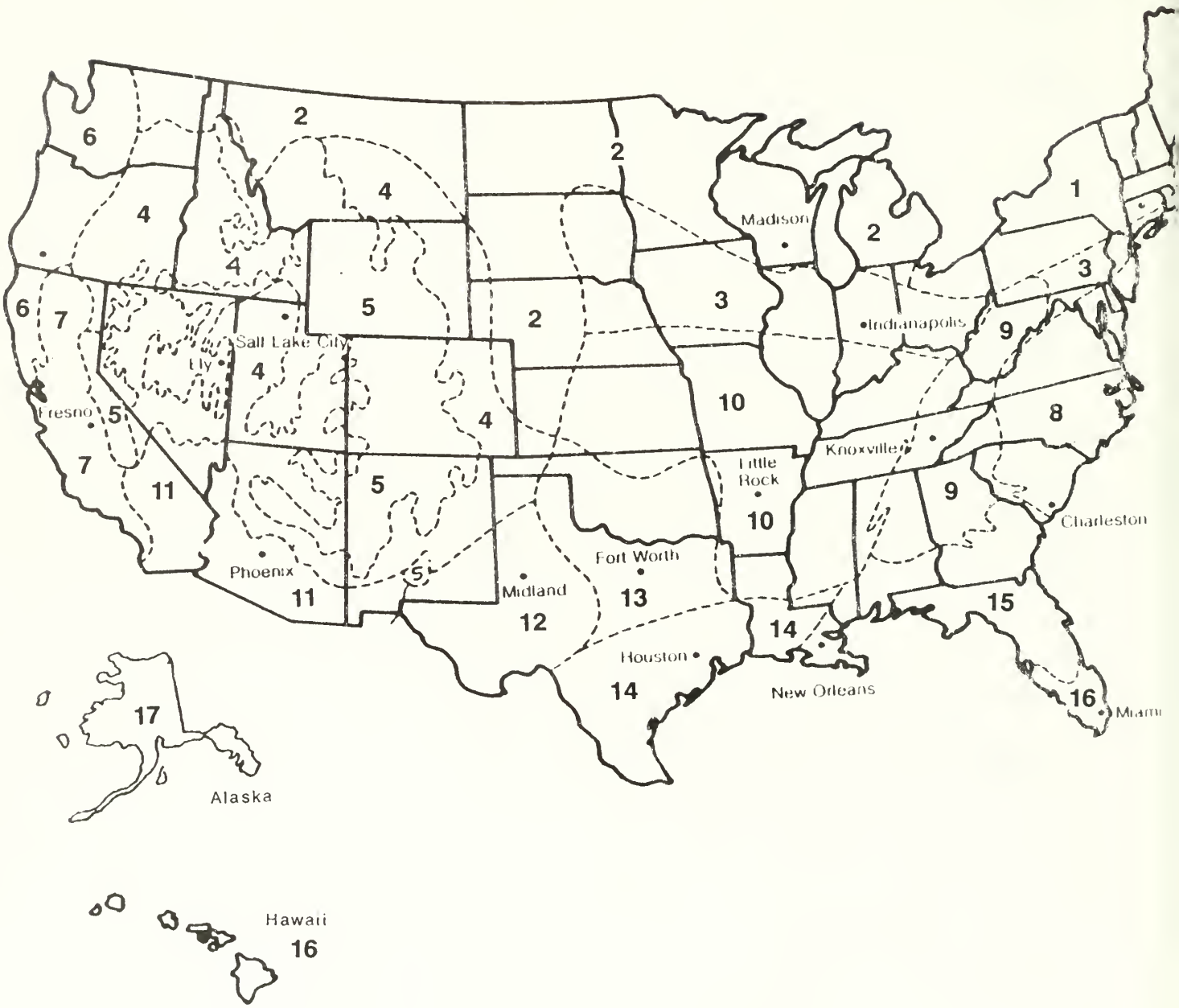
Each of the following geographic sections lists these characteristics in numerical order of importance. You--the builder or designer--should keep these priorities in mind in dealing with each climatic condition.

WHICH IS YOUR CLIMATE?

The United States has hundreds of localized design climates. For a preliminary analysis, seventeen regions have been identified that seem to be representative.

For each residential climate some priorities have been set and illustrated with examples indigenous to that climate. You may find that the climatic description for your area does not accurately describe your local climate. If so, find the description that most closely resembles your site and learn your regional priorities for simple application of energy conservation to new residential construction.

United States Climate Map

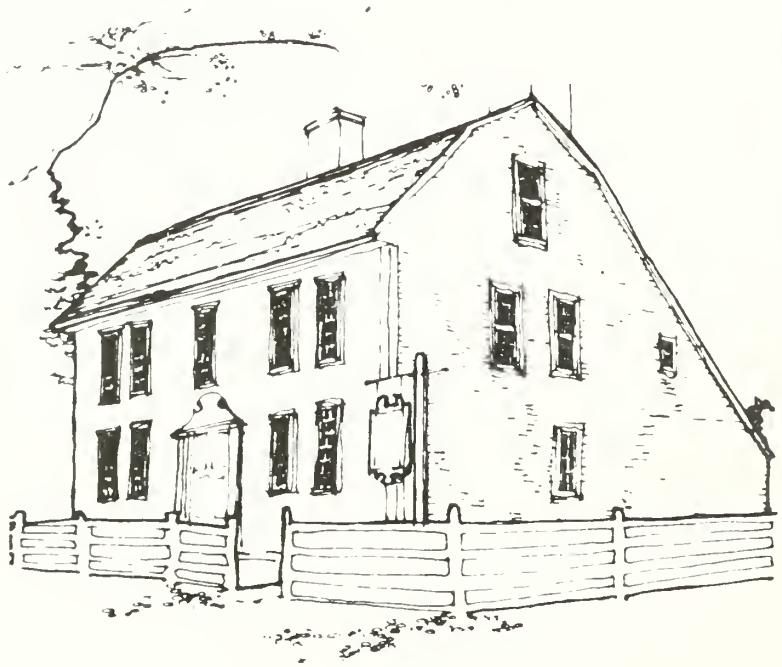


1. Northeast - Harsh winters, warm humid summers
2. North - Extreme cold winter, warm summers
3. Midwest - Cold winters, hot humid summers
4. Great Plains - Cloudy windy winters, warm dry summers
5. Mountainous West - Very cold winters, mild dry summers, large day-night temperature swings
6. Northwest Coast - Consistently cool temperatures, rain and fog, extreme microclimate variation
7. Southwest Coast - Moderately cold rainy winters, hot dry summers, reliable sunshine
8. Mid-Atlantic Coast - Cool to cold winters, warm summers
9. Appalachian - Cool winters, hot humid summers
10. Mississippi Valley Region - cold winters, hot humid summers
11. Southwest Desert - Extremely hot summers, moderately cold winters
12. West Texas Area - Cool dry winters, hot dry summers, dependable sunshine
13. North Texas Area - Potentially cold winters, hot summers with variable humidity
14. Gulf Coast - Very mild winters, hot humid summers, substantial sunshine
15. Bayou Coast - Wet cool winters, excessively hot humid summers
16. Tropics - Very mild winders, balmy sunny summers
17. Alaska - Extremely cold winters, mild summers

These climate region boundaries have been developed from ongoing research at the American Institute of Architects, Research Corporation in conjunction with the National Climatic Center of NOAA. The regions have been based on heating and cooling needs, solar usefulness in a 50° to 65°F range, wind usefulness in a 75° to 85°F range, diurnal temperature impact, and low humidity impact for natural heating and cooling of homes. Further information is available in Technical Report No. 1, from the AIA/RC.

The preceding map and climate region titles are from Passive Solar Architecture by David Wright, which simplified information in the HUD publication "Regional Design Guidelines" (see references). The Alaska region has been added by the Park Service.

NORTHEAST

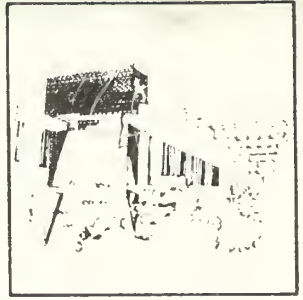


WHAT SHOULD BE BUILT HERE?

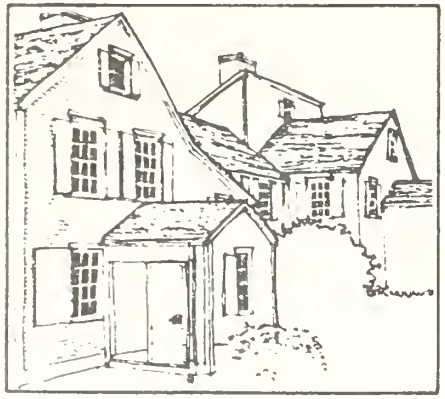
In summary, northeastern homes should be designed and built to keep the heat in and the cold out. Sites should be carefully selected for maximum winter wind protection—saving trees on the windward side of the property (with deciduous trees also retained for summer shade). Floor plans should be compact to reduce heat loss through exposed exterior surfaces. In the New England region, such homes have a snugness and warmth that cannot be duplicated in any other way. Living spaces should be oriented to the sun and away from the wind to minimize heating needs. Then, homes should be built with good thermal resistance—heavy duty thermal construction—using insulation, closets, or even mechanical spaces to prevent heat loss through the building shell. Window and door openings should be located and designed to control sun and wind impacts, opening interior spaces when needed yet offering full protection against heat loss. Passive energy homes, usually facing due south, often are designed to eliminate north side openings which only lose and never gain heat.

New homes throughout the region should be designed to permit the eventual accommodation of solar equipment technologies—for both domestic hot water and space heating. While such investments may be beyond the reach of many homeowners today, in years to come a passive energy home, more than any other type, will be most easily converted toward the use and application of solar equipment.

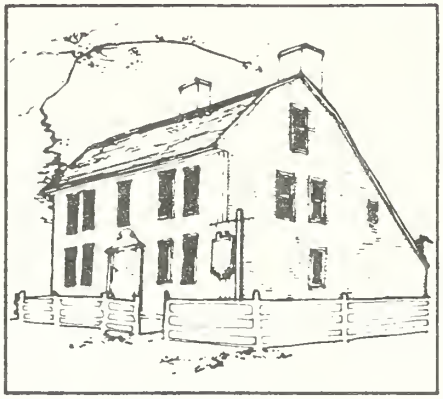
The well-designed passive energy home, responding to changing seasonal demands, effectively improves upon interior comfort conditions year-round as a response to on-site conditions and resources. Following the principles outlined, as a framework for evaluating other books and pamphlets on the same subject, the home-builder is assured of energy efficient residences from start to finish.



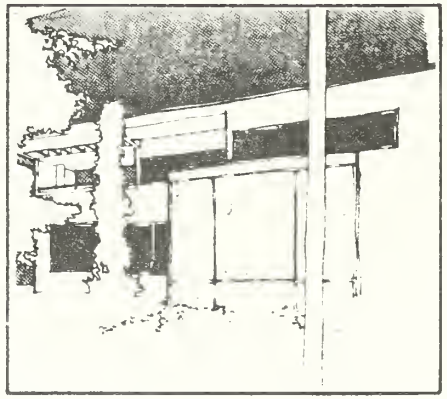
4 LET THE SUN IN BUT PROTECT THE HOUSE FROM SUMMER SUNSHINE



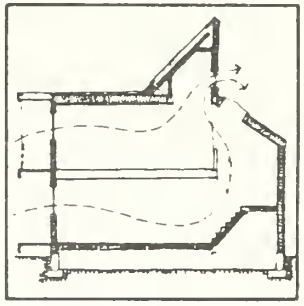
1 FIRST AND FOREMOST, KEEP HEAT IN AND COLD OUT New England homes should be compact and thermally insulated



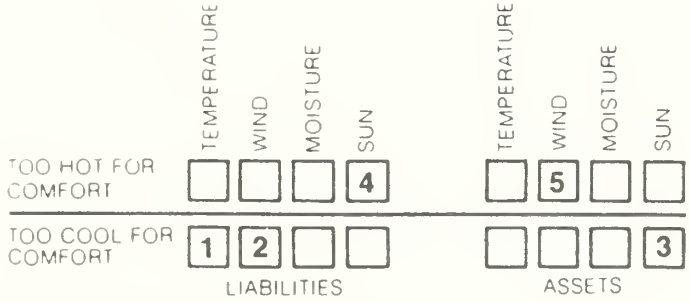
2 AVOID THE INFILTRATION AND CONVECTIVE HEAT LOSSES CAUSED BY COLD WINDS Well-sited homes built to deflect the wind in addition to careful and tight construction, can prevent infiltration losses



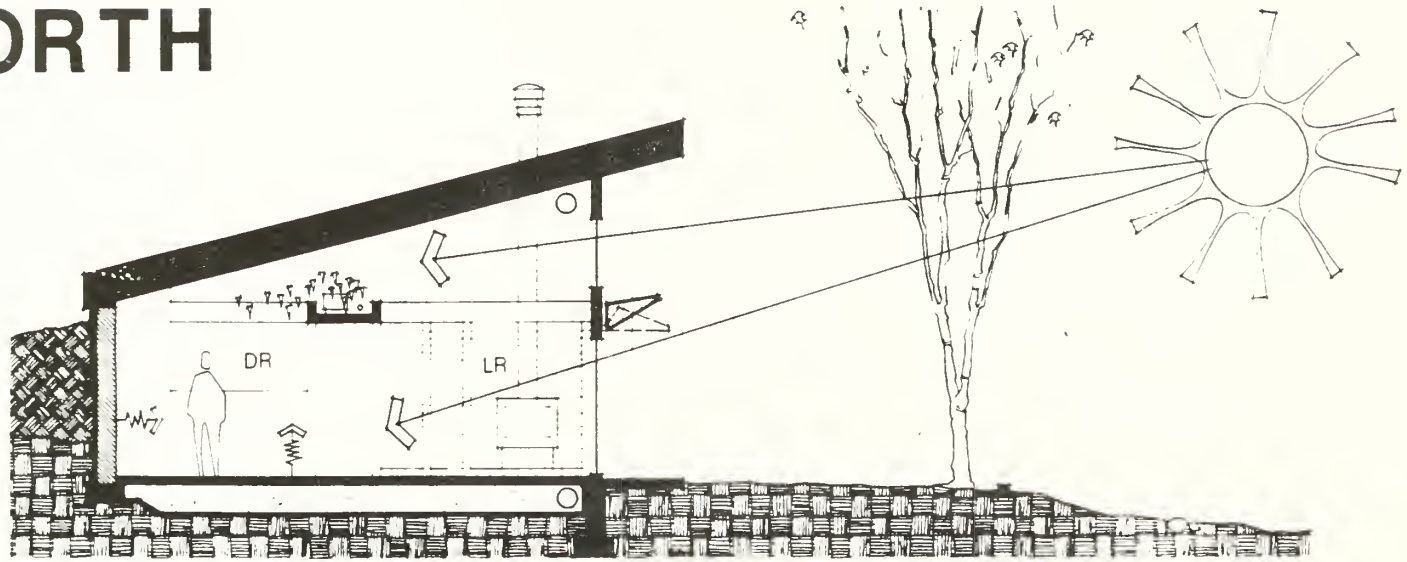
3 LET THE SUNLIGHT IN Windows and skylights facing the winter sun, but still well insulated against heat loss during non-sunshine hours, can significantly reduce heating loads



5 AVOID INFILTRATION BUT ALLOW FOR NATURAL VENTILATION



NORTHEAST

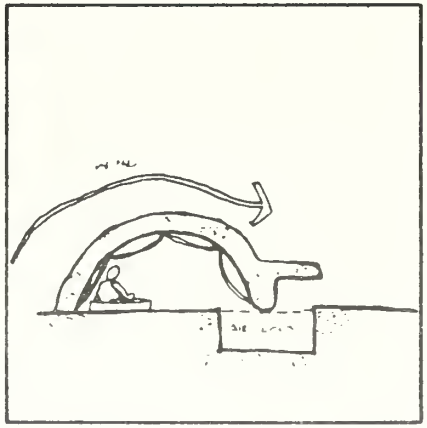


WHAT SHOULD BE BUILT HERE?

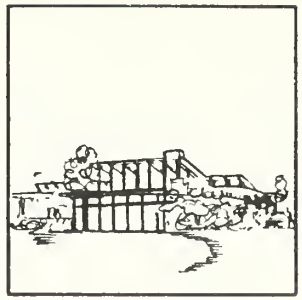
As a builder you can easily incorporate passive design ideas into your houses.

By installing adequate insulation, elongating the building on an east-west axis, moving 80% of the window area to the south, and providing overhangs, you can cut the present heating requirements in your typical residential home in half and eliminate cooling altogether. The most important thing to provide is tight, well insulated construction to keep out the cold and wind. Building into the earth or berming up against exterior walls is also desirable. For further wind protection the house should be as compact as possible, and the garage placed on the windward side. Airlocks should be placed at entries. Also, use massive walls on the south when possible to take advantage of day-to-night temperature swings. In the summer, deciduous trees can also help to eliminate undesirable heat gain. Open porches and operable windows can allow for natural ventilation to further increase summer comfort.

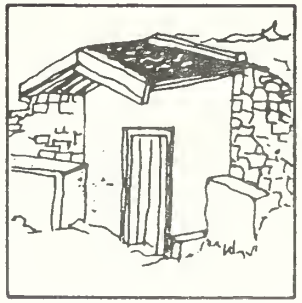
1 MOST IMPORTANTLY, KEEP HEAT IN AND COLD TEMPERATURES OUT. Siting into the hill, combined with compact forms and well-insulated construction, promises maximum energy savings



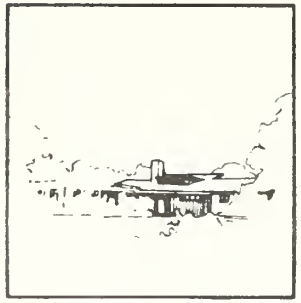
2 PROTECT FROM THE COLD WINDS TO AVOID INFILTRATION AND CONVECTIVE HEAT LOSS. Igloos are good examples of forms which lift the winds up and over, of tight no-crack construction and of airlock or vestibule entries against the cold winter winds



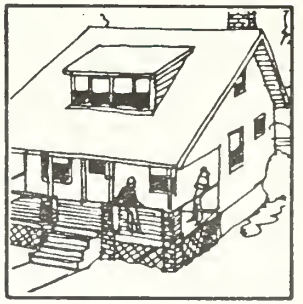
3 LET THE SUNSHINE IN



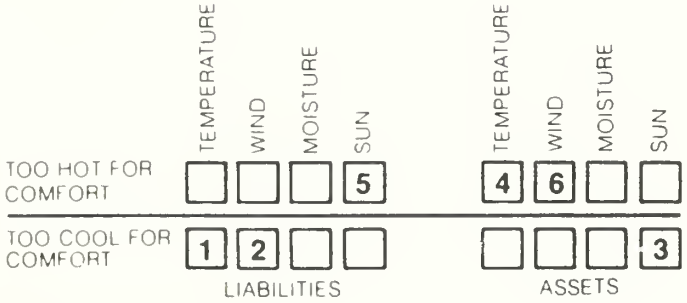
4 FLATTEN DAY-TO-NIGHT TEMPERATURE SWINGS WHEN IT'S TOO HOT FOR COMFORT

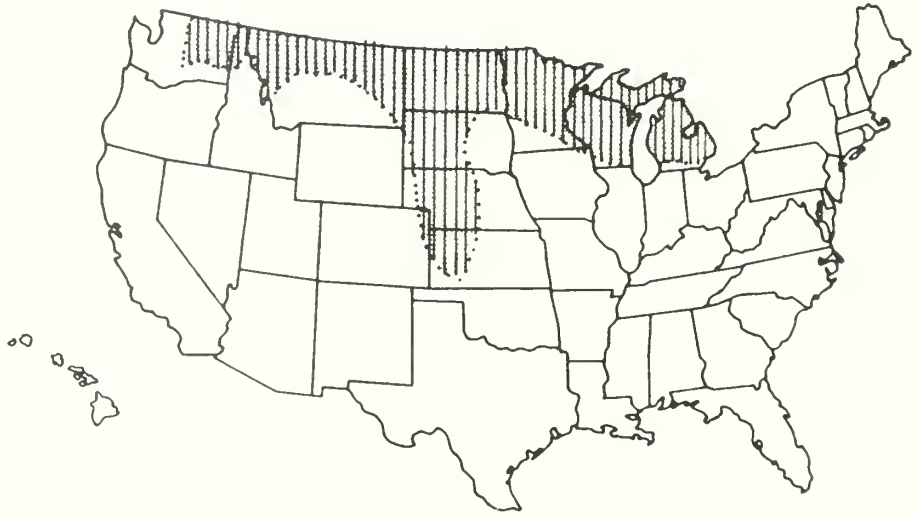


5 KEEP THE SUN OUT WHEN IT'S TOO HOT FOR COMFORT



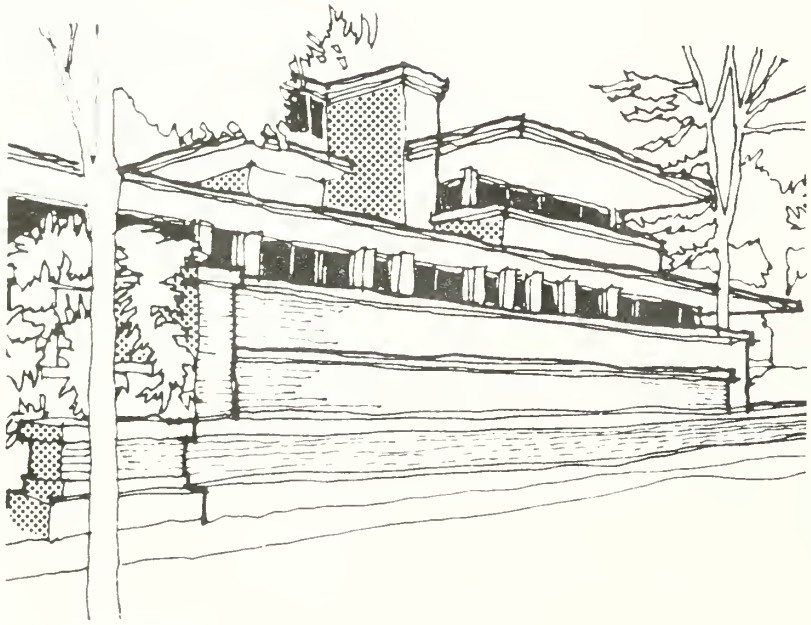
6 ALLOW THE WIND TO VENTILATE AND COOL WHEN IT'S TOO HOT FOR COMFORT





NORTH

MIDWEST



WHAT SHOULD BE BUILT HERE?

Mandan Indians made buildings that were warmly insulated by layering poles, willow mats, prairie grasses and bark. An airlock was protected with buffalo hide curtains at either end.

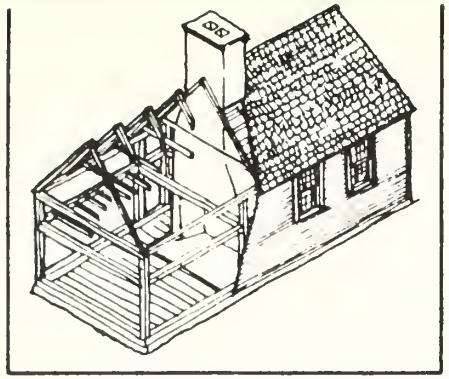
Early settlers adapted traditional English houses by reducing living space and window area, using wood as the building material and placing a massive chimney in the center to store and radiate heat.

These strategies, reducing heat loss and heating load, are still the core of energy conservation.

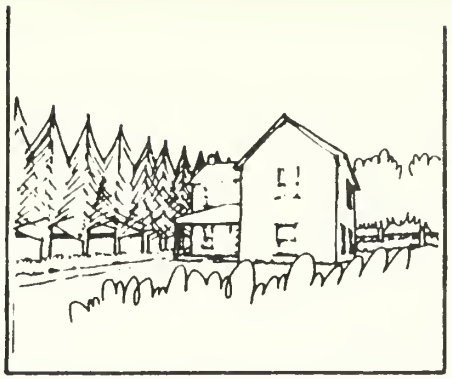
To summarize this climate, houses should be small, compact, well-insulated, caulked and weatherstripped for winter comfort. Windows should be triple glazed, shuttered, held to a minimum on the east and west and avoided on north elevations. Materials should be selected for thermal efficiency and construction tightness, while windbreaks should be planted to intercept winter winds. A site should be selected where the house can be solar oriented. Strategies for solar heat gain and storage should be used for the passive (non-mechanical) heating of homes.

When it's too hot for comfort, the insulation and material choices described above will reduce heat gain in summer just as they reduced heat loss in winter. Overhangs can be provided to block the high summer sun while admitting low winter sun. Shutters which reduce winter heat loss will also reduce summer heat gain and keep out unwanted sun.

Judicious design of openings, porches, and outdoor living spaces will provide natural ventilation for passive cooling, while plants, such as deciduous trees, will block the summer sun and provide a cooler site.

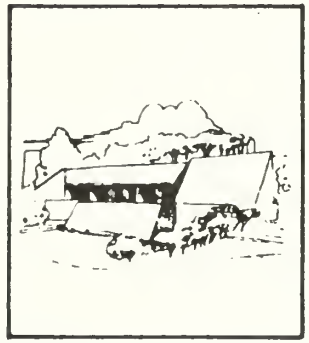


1 KEEP THE HEAT IN AND COLD TEMPERATURES OUT WHEN IT'S TOO COLD FOR COMFORT.

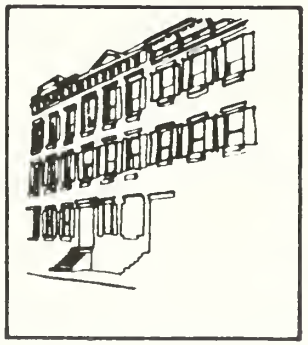


2 PROTECT FROM THE WIND WHEN IT'S TOO COLD FOR COMFORT

3 LET THE SUNLIGHT IN WHEN IT'S TOO COLD FOR COMFORT



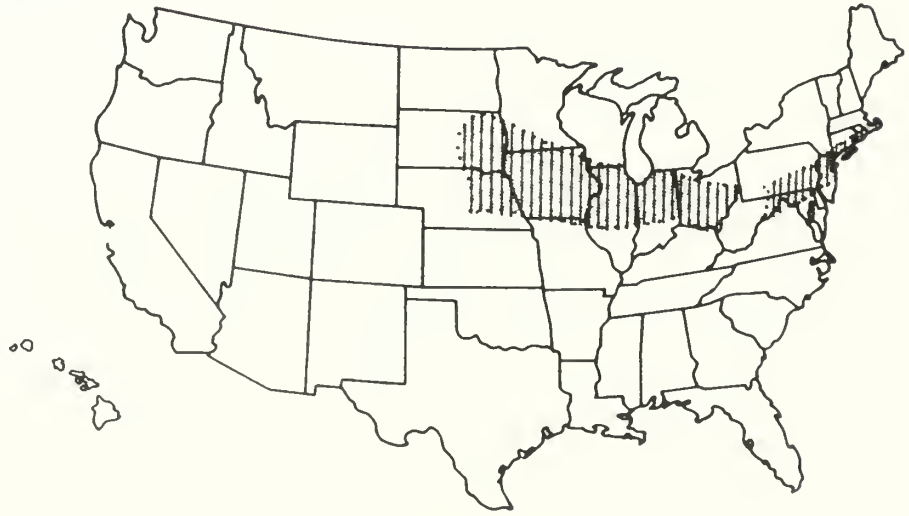
4 KEEP HOT TEMPERATURES OUT DURING THE SUMMER WHEN IT'S TOO HOT FOR COMFORT.



5 PROTECT FROM THE SUN WHEN IT'S TOO HOT FOR COMFORT

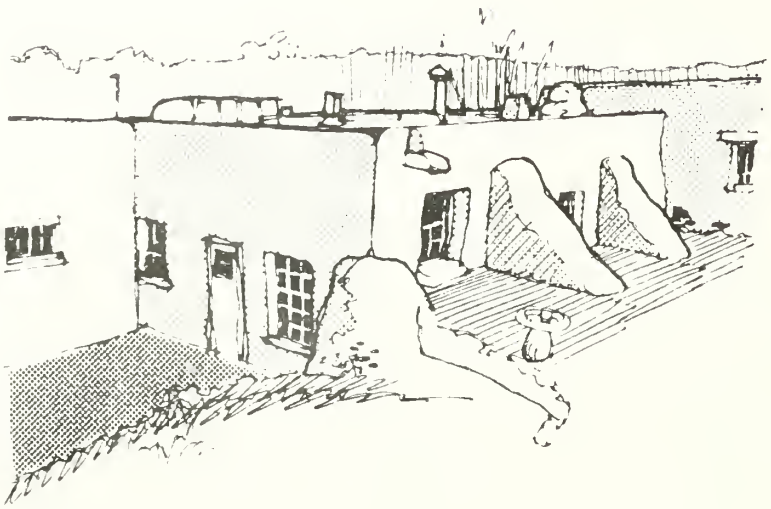
6. OPEN UP TO COOLING BREEZES WHEN IT'S TOO HOT FOR COMFORT.

	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT	4			5		6		
TOO COOL FOR COMFORT	1	2						3
	LIABILITIES				ASSETS			



MIDWEST

GREAT PLAINS



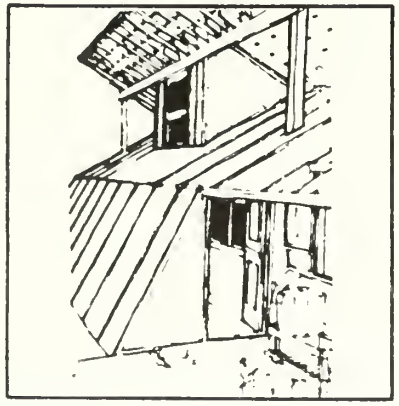
WHAT SHOULD BE BUILT HERE?

A passively designed residence for the plains must be shielded from the harsh elements of the winter wind, snow, and rain. At the same time it must open up to the more desirable elements of winter sun and summer breezes. This apparent contradiction of architectural responses is actually the essence of passive design. The building must act as a dynamic shell that transforms with the seasons, responding to the assets of climate, while rejecting the liabilities.

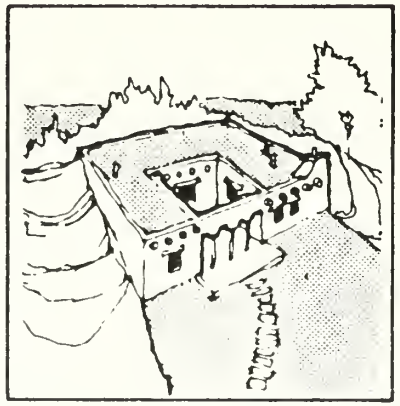
The climate of the plains and plateaus is mainly too cool or too cold for comfort. Keeping out the cold while capturing the sun to heat up the home in winter is your primary concern. Protect the home from the cold winds to minimize infiltration and convective losses. Landscaping and earth berms can be useful here. Use vestibule entry spaces to prevent sweeping air exchanges with the outside, and place auxiliary spaces (closets, bathrooms, laundry) against the cold north and west walls. Pay special attention to keeping the heat in and cold temperatures out. Insulate the house and use massive, heavy building materials, such as stone, brick or concrete, to store internal heat gain and temper outside temperature extremes. During the few hot months, for natural ventilation and evaporative cooling relief, place bodies of water or plants in the path of the prevailing winds. In addition, keep out the summer sun but let in the winter sun by positioning the building in the shade of trees and other buildings and adding well-designed shading devices.

All in all, flexible design is very important here since sun and wind can be both a liability and an asset. Therefore, a home which can open and shut to different climate forces at different times of the year will be most energy conserving and comfortable.

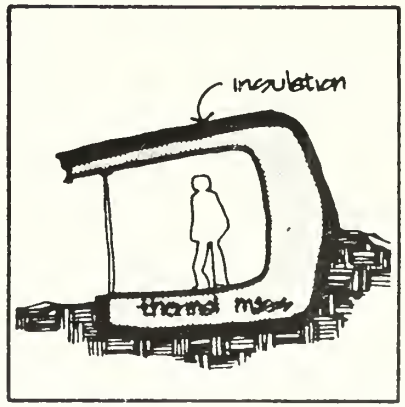
4 PLACE BODIES OF WATER OR PLANTS IN OR NEAR THE HOUSE TO PROVIDE EVAPORATIVE COOLING IN SUMMER THIS ALSO HELPS TO RAISE THE HUMIDITY



1 LET THE SUNLIGHT IN A high percentage of sunshine provides a good opportunity for solar heating in this climate



2 PROTECT FROM THE COLD WINTER WINDS Divert or screen winter winds before they reach the home However utilize summer winds to provide natural ventilation when it's too hot for comfort

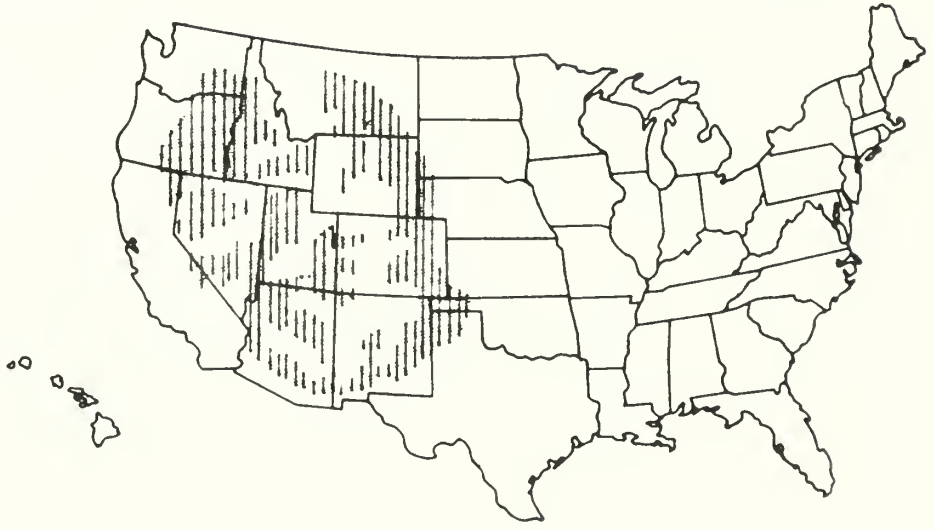


3 KEEP THE HEAT IN AND COLD TEMPERATURES OUT Insulate against the low temperatures which predominate in this region

5 ALLOW SUMMER WINDS TO VENTILATE AND COOL

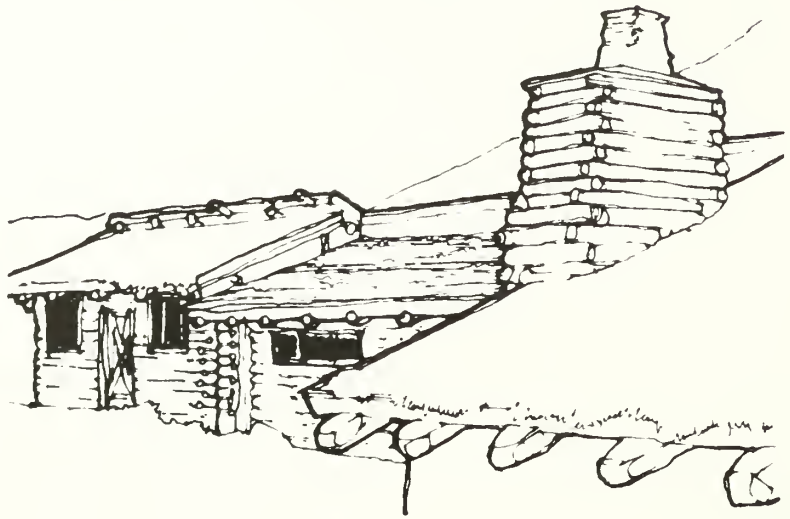
6 KEEP THE SUN OUT WITH SHADING DEVICES AND VEGETATION WHEN IT S TOO HOT FOR COMFORT

	LIABILITIES				ASSETS			
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT				6	3	5	4	
TOO COOL FOR COMFORT		2			3			1



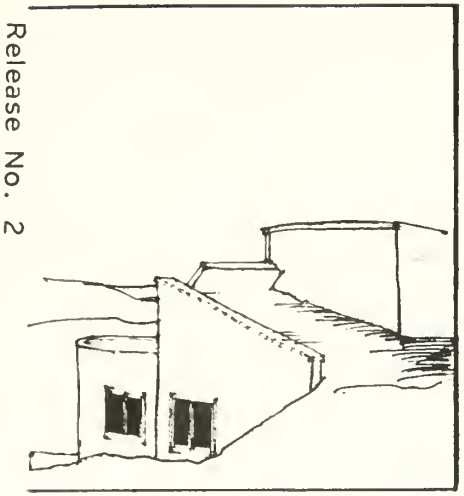
GREAT PLAINS

MOUNTAINOUS WEST

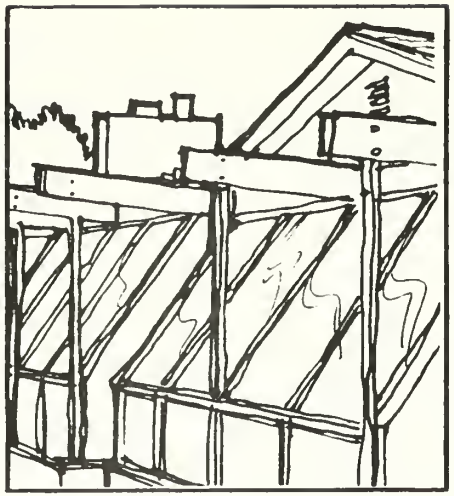


WHAT SHOULD BE BUILT HERE?

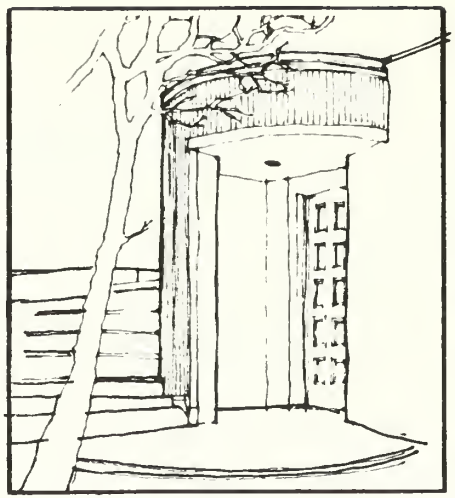
In summary, this climate is relatively easy to build for in that all of the conditions are consistently too cool or cold for comfort, thus minimizing design conflicts. Temperatures are your primary concern. Maintain a compact plan to minimize the exterior surface area, and attempt to "nestle" the building into the site. Insulate the house thoroughly and use thermal masses in the interior to modify temperature swings. Pay special attention to windows, using multiple glazing and being sure to insulate at night. Minimize the number of exterior doors, and provide them with airlocks or vestibules. Cluster all chimneys and flues in the center of the house. Maximize solar gain by building on north slopes facing south and by taking into consideration trees and mountains which may cut off winter sun. In addition to massive materials, use dark colors and rough textures on the exterior of the building to maximize heat absorption. Finally, in designing to avoid the cooling effects of winds, use landscaping and windscreens to protect the house.



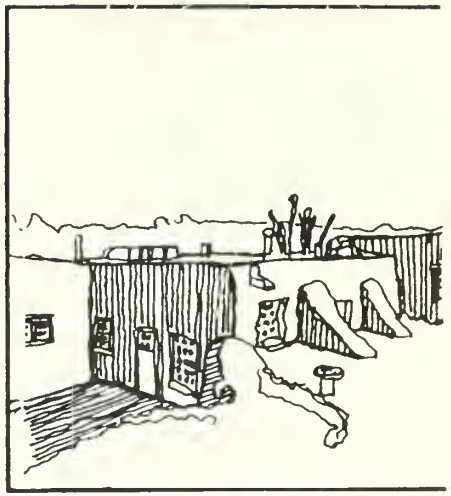
1 KEEP THE HEAT IN AND COLD TEMPERATURES OUT Temperatures are a liability most of the year This suggests compact floor plans, extensive insulation and well-protected openings



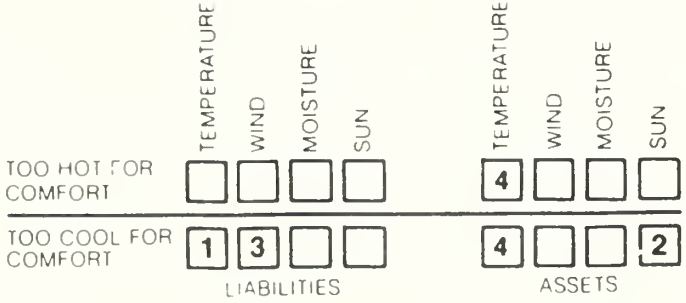
2 LET THE SUN IN Collecting solar heat in heavy walls sunrooms or greenhouses minimizes heating needs throughout the year Passive solar systems can almost eliminate the need for mechanical heating

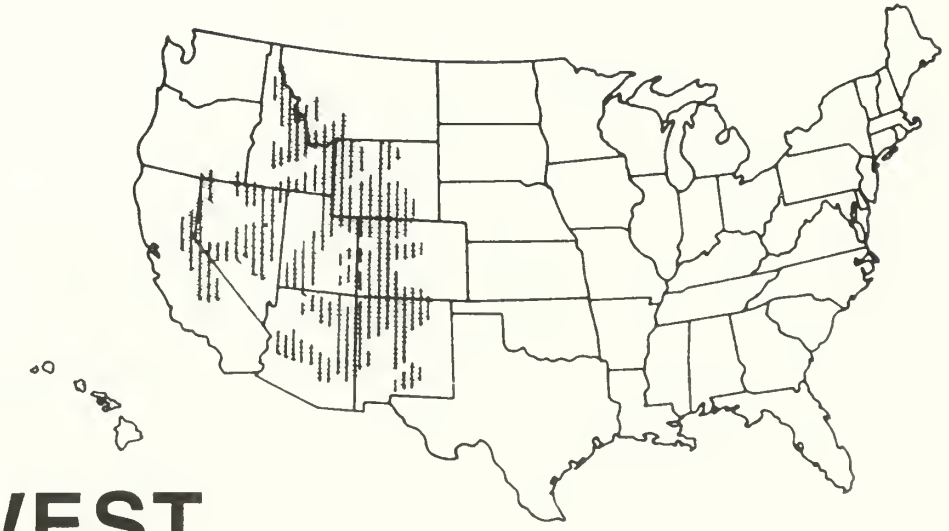


3 PROTECT FROM THE WIND Site the house to prevent cold winds from drawing heat from it Provide airlock vestibule entries and use wind breaks



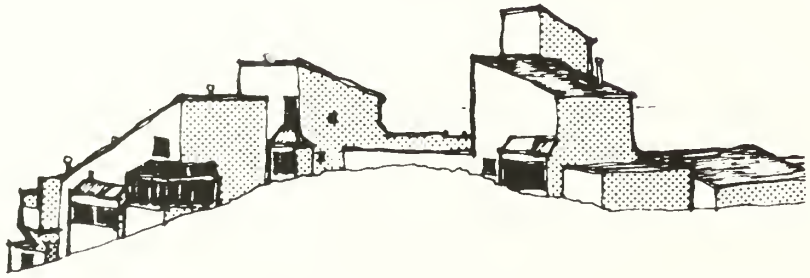
4 IN CLIMATES WITH A BIG DAY-TO-NIGHT TEMPERATURE DIFFERENCE USE MASS TO SMOOTH OUT TEMPERATURE FLUCTUATION





MOUNTAINOUS WEST

NORTHWEST COAST



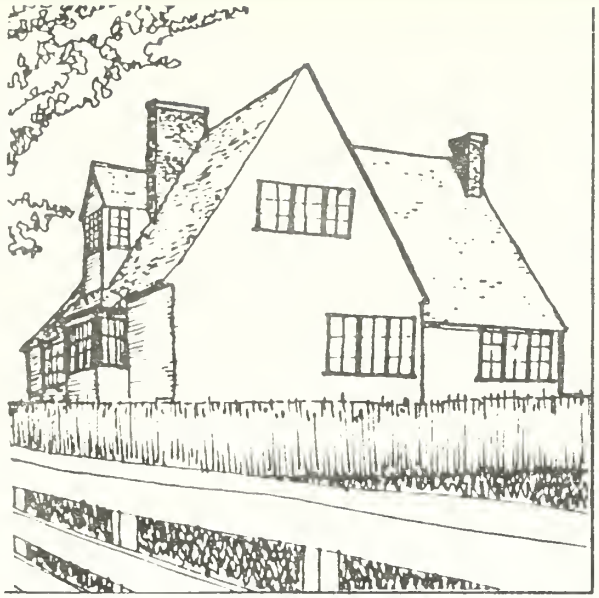
WHAT SHOULD BE BUILT HERE?

Along the California-Oregon coast, buildings should be sited, when possible, above the fog belt for maximum sunshine and away from windy ridge tops. Homes should be compact and grouped together to provide mutual protection from the wind and to share internal heat. Landscaping, berms, and fences should also be used for wind protection. Sheltered outdoor spaces open to the sun should be provided.

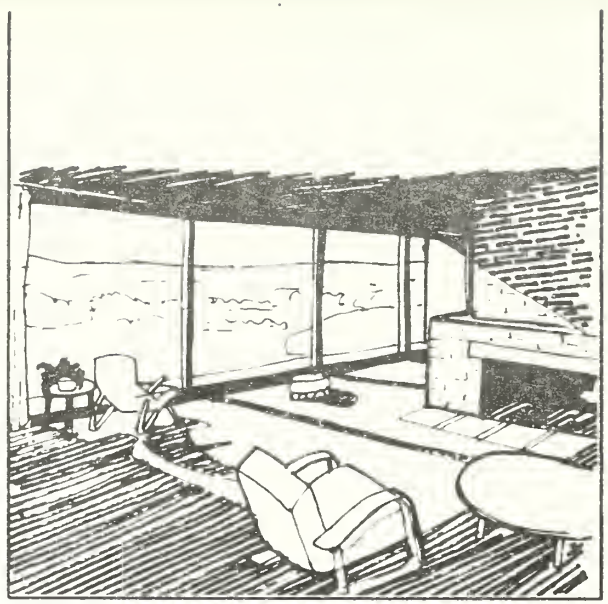
The buildings should be well insulated and weatherstripped. The California State Energy Conservation Building Code requires a minimum of R-11 insulation in the walls, and R-19 in the roof. The building interior should contain some dark colored massive construction materials, such as a stone fireplace. The mass should be located where it will receive direct sunlight.

Windows and skylights should be placed on the south, southeast, and southwest for solar gain. However, large areas of windows and skylights should be insulated at night. North facing windows should be kept at a minimum or eliminated completely as protection from the cold winds. Light surfaces should be placed around the windows to reflect additional solar radiation into the building. In areas with warm summers, some exterior window shading may be needed to keep the building from overheating.

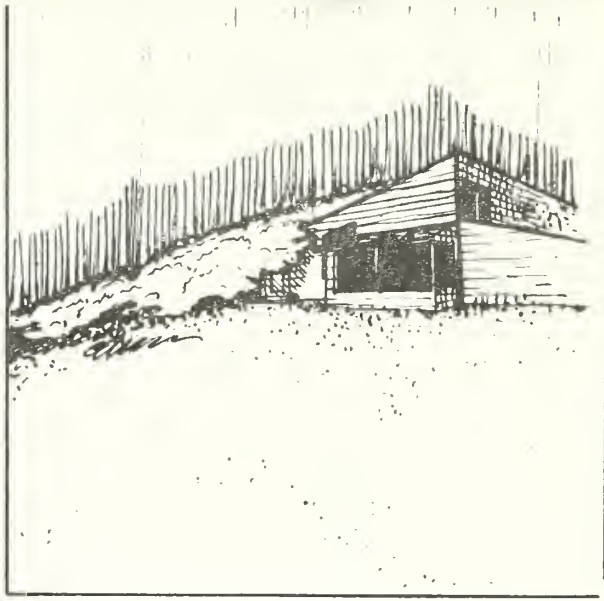
Release No. 2
September 1988



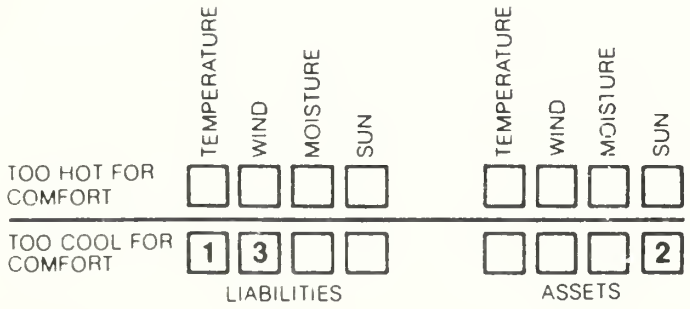
1 PROTECT THE BUILDING FROM HEAT LOSS A well-insulated tightly-sealed house is important for maintaining comfortable conditions within the building



2 LET THE SUNSHINE IN Even though the amount of available direct solar radiation is not that great properly designed windows can make a significant contribution to the daytime heating needs of a building

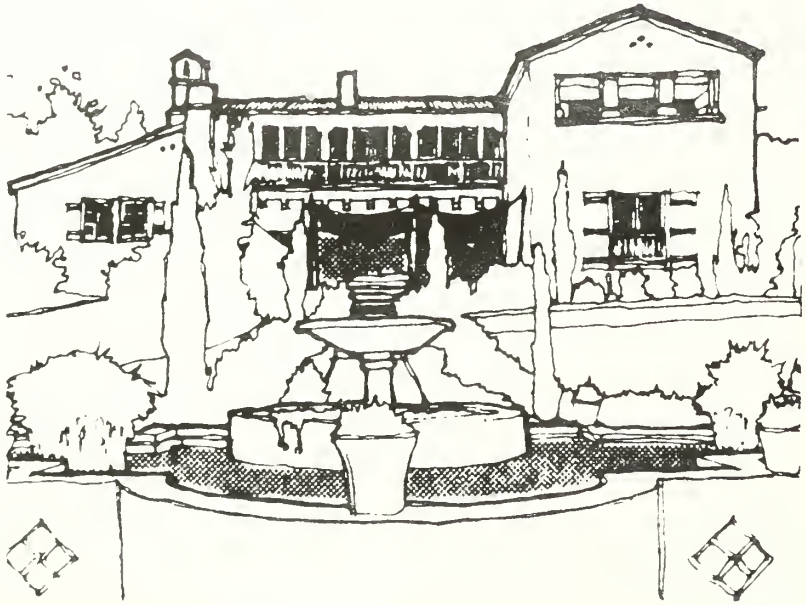


3 PROTECT FROM THE WIND Wind protection is best achieved by sheltering the outside of the building Siting, landscaping and building shape play key roles in wind protection



NORTHWEST COAST

SOUTHWEST COAST



WHAT SHOULD BE BUILT HERE?

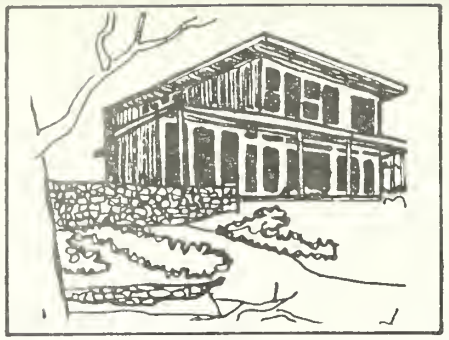
Ideally, buildings should be sited on south, southeast, or southwest slopes. Avoid north slopes, or slopes facing directly east or west. Buildings should be oriented with their long axis and large window areas facing south. East and west windows should be minimized. Landscaping and fence placement should be done carefully to insure that the south windows are exposed to the winter sun. Plants, fences and other buildings can be used to protect the house from cold winter winds.

The California State Building Code requires that all residential buildings incorporate R-11 wall insulation and R-19 roof insulation. Buildings should also be weatherstripped and thoroughly sealed. Massive building materials, such as concrete slab floors covered with tile, should be used in the structure to flatten out the day-to-night temperature swings. As much of the mass as possible should be exposed to the winter sun, but no sun should fall on the mass in the summer. Finally, light colored roofs and walls should be used to reflect the summer sun.

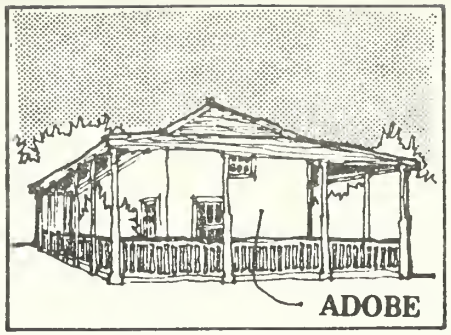
In the Central Valley, south facing windows should be designed to admit the winter sun, but it is essential to shade all windows in the summer. South windows can easily be shaded by overhangs and trees, while east and west windows are easiest to shade with vertical shading devices.

Several additional measures can be used to improve natural cooling in a house. Operable windows or vents should be placed on opposite sides of the house to allow for night cooling. At least one set of these windows should face the night breezes. Evaporative coolers should be used instead of air conditioners.

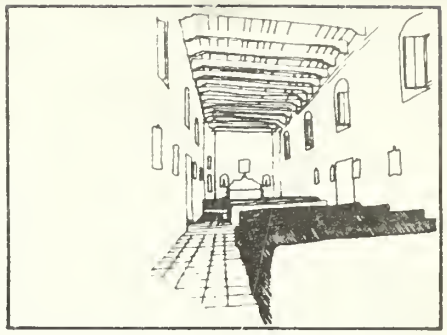
Finally, provisions should be made to allow outdoor living, both in hot weather and in cooler weather. Shaded places and patios should be provided for the summer. Sunny outdoor spaces should be provided for use during the cooler months.



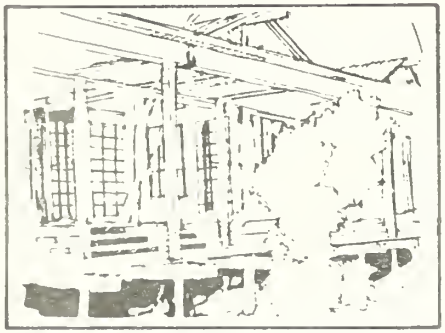
1 ADMIT THE SUN IN WINTER TO MINIMIZE NEED FOR HEATING



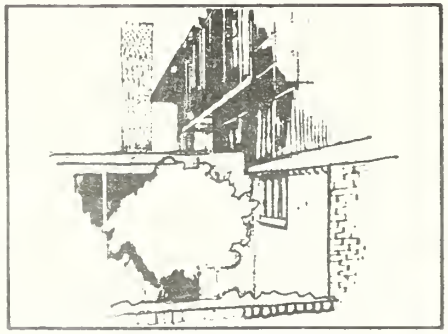
2 REDUCE WINTER HEAT LOSS



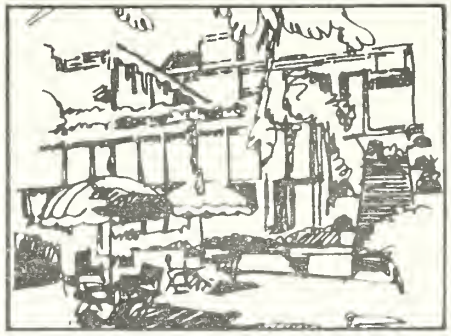
3 USE MASSIVE CONSTRUCTION MATERIALS AND NIGHT VENTILATION TO USE DIURNAL SWING FOR NATURAL COOLING



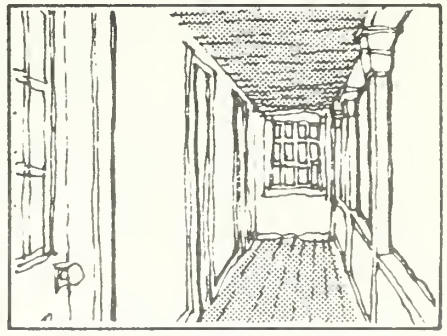
4 KEEP THE SUN OUT OF THE BUILDINGS TO MINIMIZE THE NEED FOR COOLING



5 UTILIZE THE SUMMER WINDS TO PROVIDE NATURAL VENTILATION AND COOLING



6 USE EVAPORATIVE COOLING WHEN IT'S TOO HOT FOR COMFORT



7 PROTECT BUILDINGS FROM COLD WINDS WHEN IT'S TOO COOL FOR COMFORT

	LIABILITIES				ASSETS			
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT				4	3	5	6	
TOO COOL FOR COMFORT	2	7			3			1

SOUTHWEST COAST

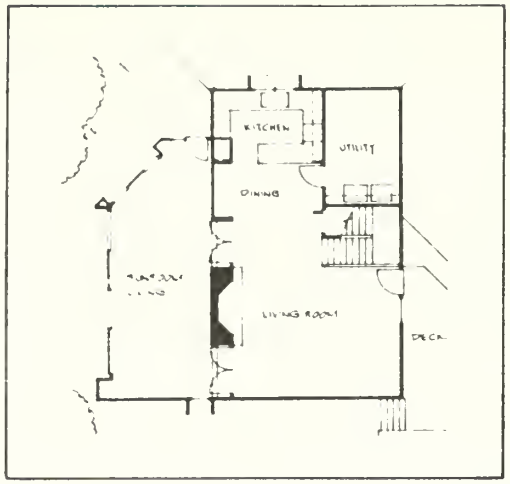
MID-ATLANTIC COAST

WHAT SHOULD BE BUILT HERE?

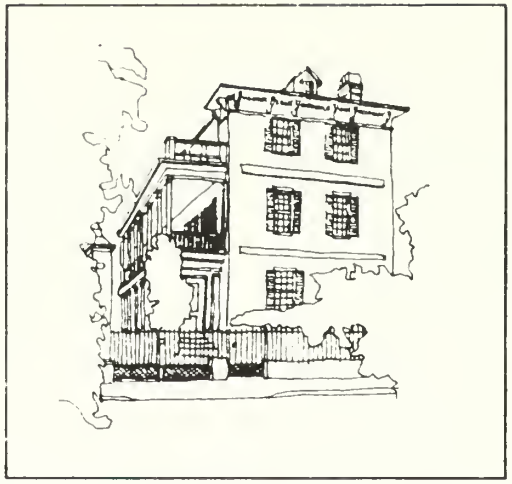
In summary, houses in this climate should be well-insulated against consistently cool temperatures. Floor plans should be zoned for internal living with less essential buffer spaces on the exterior walls. Careful attention should be given to insulation, including shutters or drapes on glass areas. House placement and orientation should allow the use of prevailing breezes for ventilation around and through opened-up living areas. Narrow floor plans, large openings, and vertical spaces with belvederes or ventilation outlets facilitate air movement through the house. Large windows not only aid ventilation, but with proper orientation can maximize solar heat gain in the winter. Deciduous trees and proper overhangs can allow the low winter sun to penetrate south glass and warm the house (this solar benefit is maximized in passive solar systems, with direct space heating, heat storage walls, or sunspaces). In summer, orientation, landscaping, overhanging roofs, shutters, and vertical shading devices for east-west walls must be utilized for shade. Maximizing ventilation and excluding summer sun reduces the need for air conditioning. Fans and dehumidification devices offer the most conserving space conditioning. Shaded, screened outdoor areas provide comfort a large part of the year.

In addition to these major energy conserving solutions, other concerns include reducing air infiltration in cold weather and avoiding creation of additional humidity in summer. In those areas with large diurnal temperature differences, heavier construction can smooth temperature extremes in the living space.

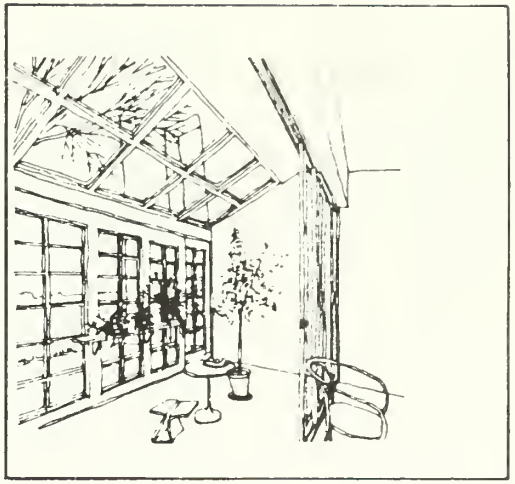
Release No. 2
September 1988



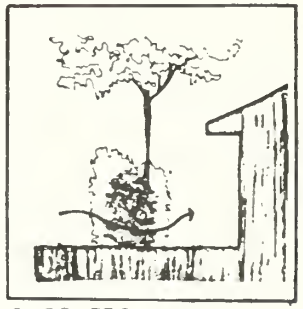
1 KEEP THE COLD OUT Insulate against the winter cold but allow living space to open to comfortable conditions



2 & 5 ALLOW WINDS TO VENTILATE Design for maximim ventilation which is an asset most of the year but beware of uncontrolled air movement (infiltration)

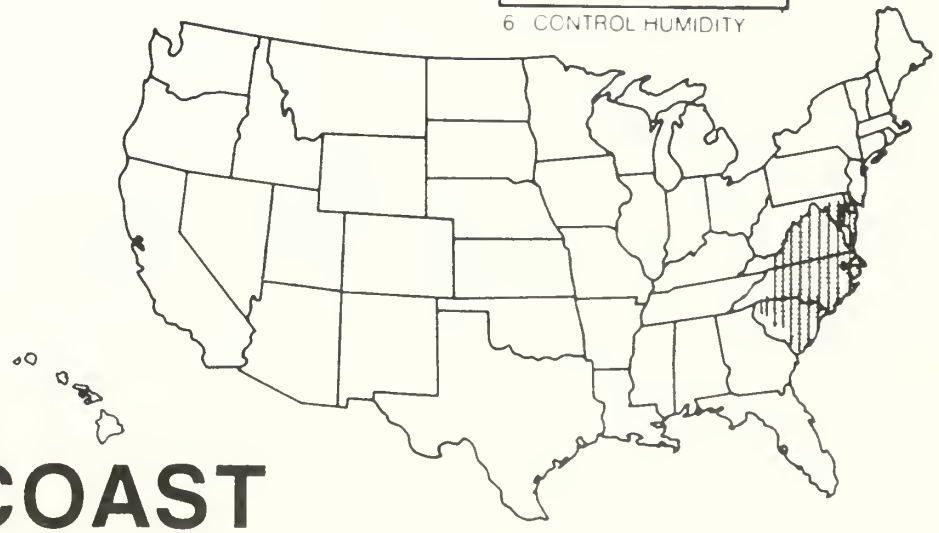


3 & 5 SUNLIGHT Control sunlight letting it in during winter but keeping it out in summer



6 CONTROL HUMIDITY

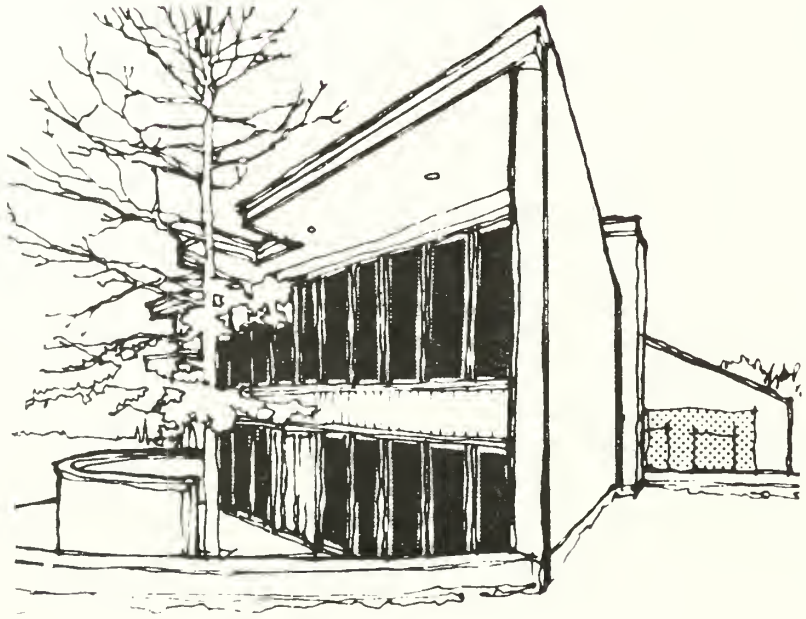
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT			6	4		2		
TOO COOL FOR COMFORT	1	5						3
	LIABILITIES				ASSETS			



MID-ATLANTIC COAST

Release No. 2
September 1988

APPALACHIAN



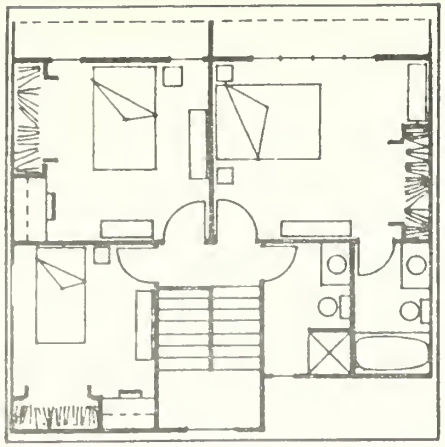
WHAT SHOULD BE BUILT HERE?

In summary, houses in the Appalachian climate should be well insulated against consistently cold temperatures. Compact floor plans, buffer spaces on exterior walls, and insulating shutters or drapes prevent unnecessary heat loss in winter. Massive or heavy building materials such as stone, brick, concrete or even logs should be used in combination with exterior insulation to store internal heat gains and temper outside temperature extremes. The house orientation, in addition to well placed openings and basement and attic vents, should allow the use of prevailing summer breezes for ventilation around and through the home.

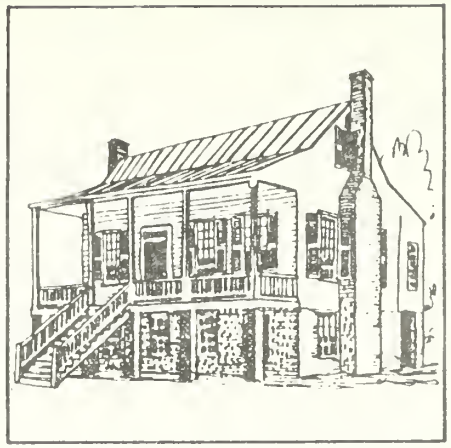
When these priority guidelines are successfully followed, several secondary guidelines can ensure the efficiency of the passive energy conserving home. Windows should be sized and placed to collect the southern sun in winter, but they should also be shuttered to prevent heat loss at night and shaded to prevent overheating in summer. Deciduous trees and proper overhang design allow the low winter sun to penetrate south-facing windows for passive solar heating but block the higher summer sun. Evergreen trees, earth berms and tight construction can prevent unnecessary infiltration from the northwest while allowing for the blessings of summer breezes from the south and southwest.

All entrances should be sheltered from the cold winter winds by proper placement, wing walls or the addition of airlock vestibules. Finally, home designs should avoid creating additional humidity through the addition of pools of water or heavy planting in the direction of the prevailing winds, and maximize the use of desiccation and natural ventilation systems for non-mechanical comfort.

Release No. 2
September 1988



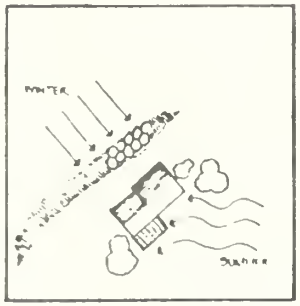
1 PROTECT FROM COLD WINTER TEMPERATURES Use insulating earth continuous insulation, unoccupied spaces and window shutters to isolate the living spaces from the winter cold



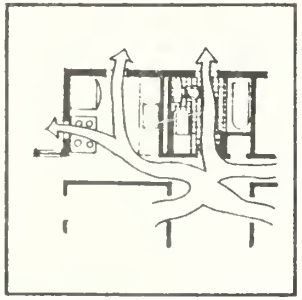
2 FLATTEN DAY-TO-NIGHT TEMPERATURE SWINGS For year-round comfort, build some living spaces behind massive walls to provide time-lag heating and cooling Build other spaces behind insulated lightweight walls for quick responses on comfortable days

3 OPEN TO THE SUMMER WINDS FOR NATURAL VENTILATION Well placed openings let air move around and through the house for cooling by natural ventilation Provide outdoor living spaces for optimum use of winds

4 LET THE SUNSHINE IN WHEN IT'S TOO COOL FOR COMFORT BUT BLOCK OUT THE SUN WHEN IT'S TOO HOT

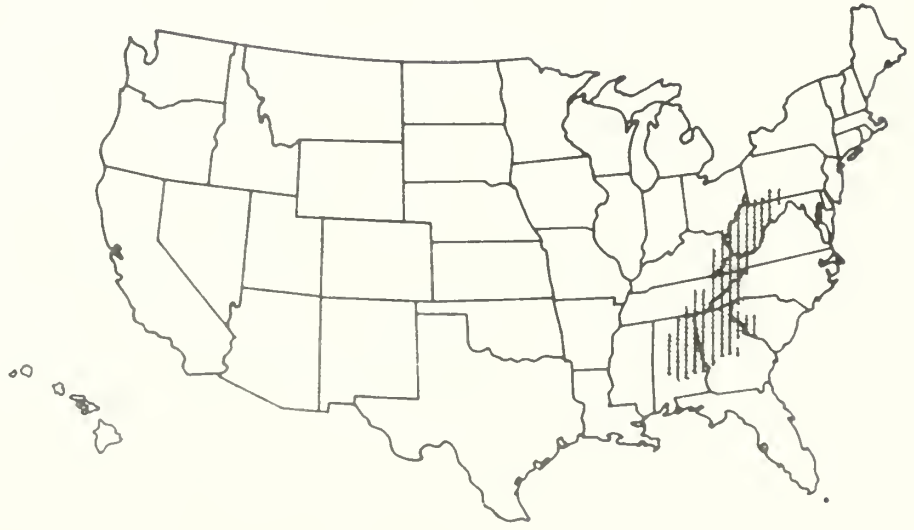


5 PROTECT FROM THE WINTER WINDS



6 AVOID CREATING ADDITIONAL HUMIDITY

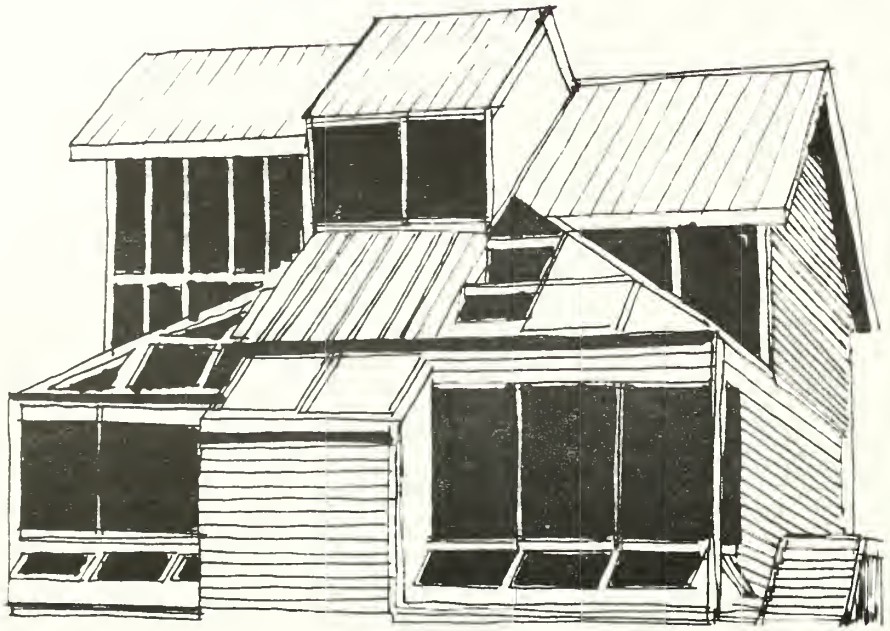
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT			6	4	2	3		
TOO COOL FOR COMFORT	1	5			2			4
	LIABILITIES				ASSETS			



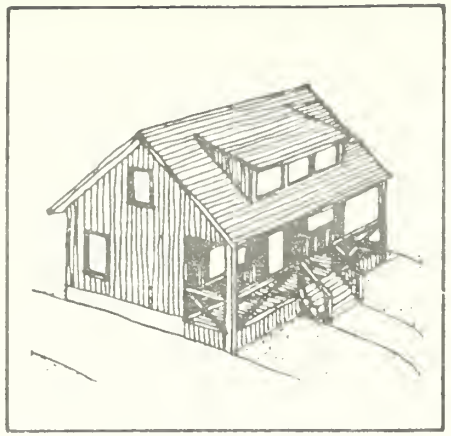
APPALACHIAN

MISSISSIPPI VALLEY REGION

WHAT SHOULD BE BUILT HERE?



In summary, houses in this region should be well insulated against consistently cool temperatures. Floor plans should be zoned for internal living, with less essential buffer spaces on the exterior wall. Careful attention should be given to resistance insulation, and insulating shutters or drapes should be used on all glass areas. Solar heating should be utilized to its fullest extent. Large windows on the south side can maximize solar heat gain in winter, while shading protection can be provided in summer. Allow the low winter sun to penetrate and warm the house, and later use direct space heating from heat storage walls. At the same time orientation, landscaping, overhanging roofs, shutters and vertical shading devices must be utilized for summer shade. During warmer months, house placement and orientation should use prevailing breezes for ventilation around and through open-plan living spaces. Narrow floor plans, large openings, and vertical outlets facilitate air movement through the house. However, reduction of air infiltration and protection from northerly winds in winter are also essential. Finally, avoid creating additional humidity in the summer.

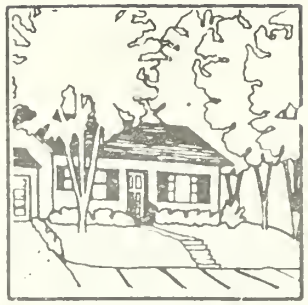


1 KEEP COLD TEMPERATURES OUT Insulate your home from the winter cold by building compact floor plans, insulating walls, and carefully using window areas to minimize heat loss. Also allow the living space to be open to comfortable conditions

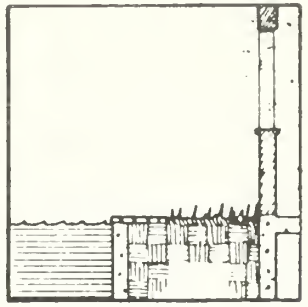
2 LET THE SUN IN On winter days, let the sunlight in for daytime warmth and passive nighttime heating

3 ALLOW WINDS TO VENTILATE Design for maximum ventilation which is an asset when it's too hot for comfort.

4 AVOID INFILTRATION

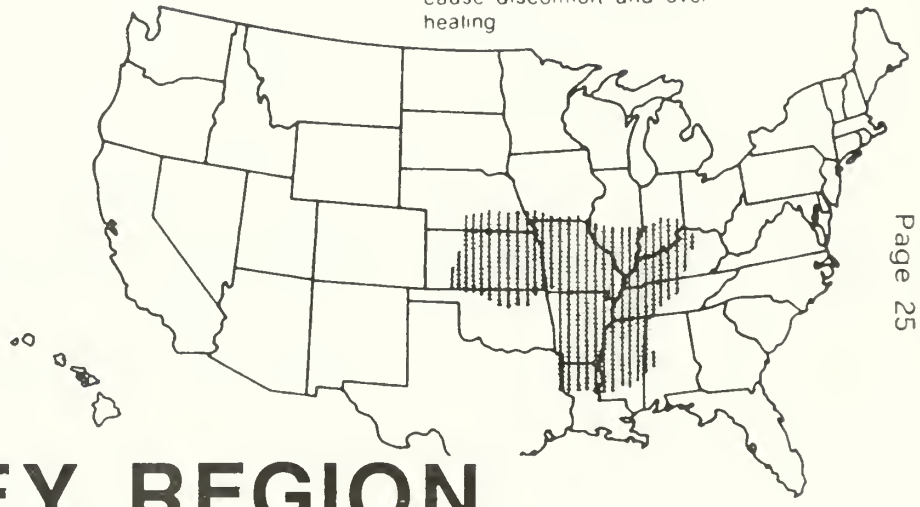


5 KEEP THE SUNLIGHT OUT Sunshine is a liability when it's too hot for comfort and can result in excessive dependence upon mechanical air conditioning



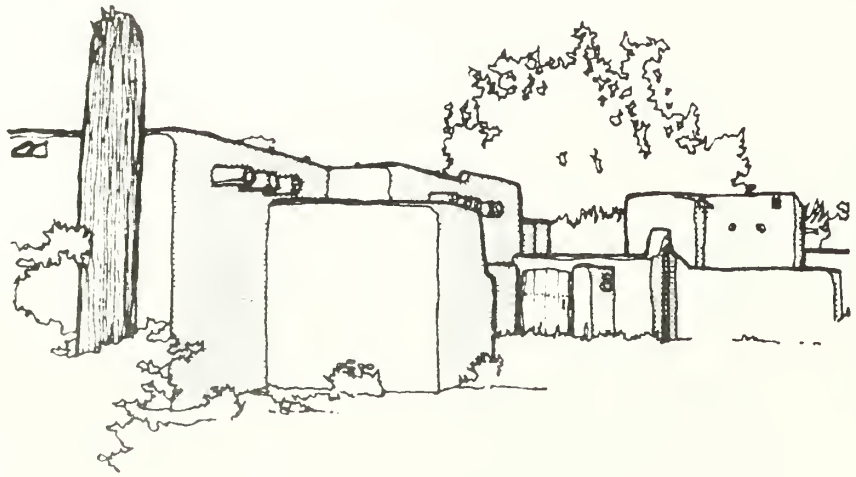
6 AVOID CREATING HUMIDITY Additional humidity could cause discomfort and overheating

	LIABILITIES				ASSETS			
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT	1		6	5		3		
TOO COOL FOR COMFORT	1	4						2



MISSISSIPPI VALLEY REGION

SOUTHWEST DESERT

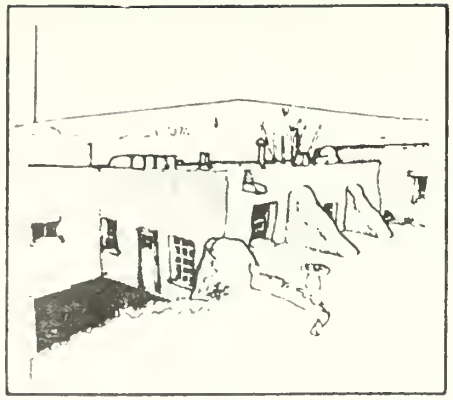


WHAT SHOULD BE BUILT HERE?

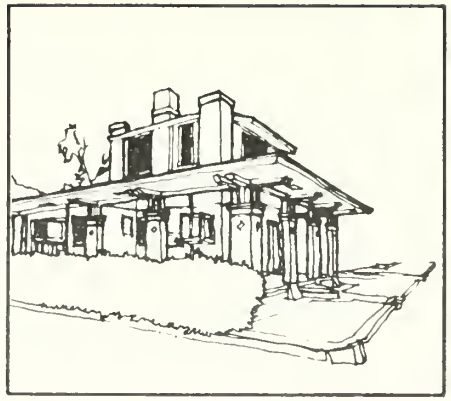
An energy efficient house in this region is a well-insulated and weatherstripped structure with massive walls which will dampen day-to-night temperature swings and eliminate the need for both heating and cooling in one day. Partial undergrounding or earth berms may also be used on some of the walls, especially those walls exposed to hot winds. The walls and roof are light colored. The windows are placed primarily on the south with any additional windows on the north. South windows are well-shaded on the exterior by overhangs, trellises, and trees. East and west windows, if any, are shaded by vertical shades and louvers.

To air condition with natural ventilation, cool night winds are brought over fountains and pools, which have been located on the windward side. Operable windows or vents must also be located both on the windward and leeward sides of the house to allow the cool, humidified air to flow through the house. If mechanical air conditioning is necessary, evaporative coolers should be used instead of air conditioners, since they are far less energy-intensive.

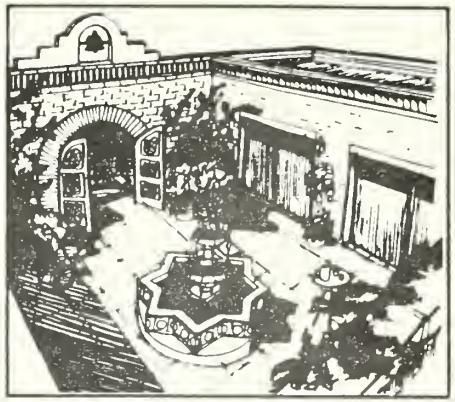
One of the energy conservation features used for cooling, the use of massive materials, will also increase the solar heating potential of the building. Sun should be admitted through south windows in the winter. A properly designed overhang will admit the winter sun yet keep out the summer sun. Some of the massive surfaces should be dark colored and exposed to the winter sun. Concrete slab floors can be covered with dark tiles, linoleum, or wood to collect and store daytime solar heat for passive nighttime heating.



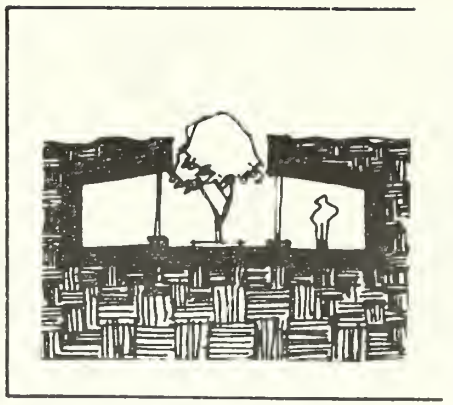
1 & 5 PROTECT THE BUILDING AGAINST EXTREME AIR TEMPERATURES Compact buildings with insulation and weatherstripping should be built, to keep out extreme summer and winter outside temperatures



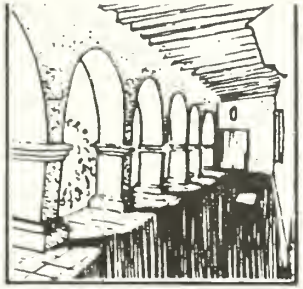
2 KEEP OUT THE SUMMER SUN All windows should be well shaded for the entire hot season Light colored roofs and walls also reduce the sun s impact on the structure



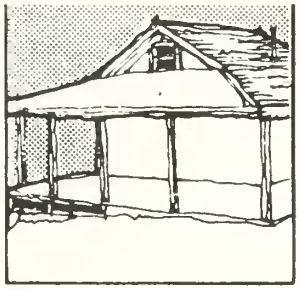
3 USE EVAPORATIVE COOLING Evaporative cooling can be incorporated into a house in a variety of ways Pools, fountains, and roof sprays can be used to humidify and cool the building Mechanical evaporation systems can be used instead of air conditioners



4 USE MASSIVE CONSTRUCTION MATERIALS AND PLACE PART OF THE STRUCTURE UNDERGROUND Massive materials can be extremely useful in damping (slowing and reducing) the effect of extreme temperatures that occur both in the summer and winter Placing part of the building underground helps to insulate the building from the exterior as well as provide constant outside design temperatures of 56°F

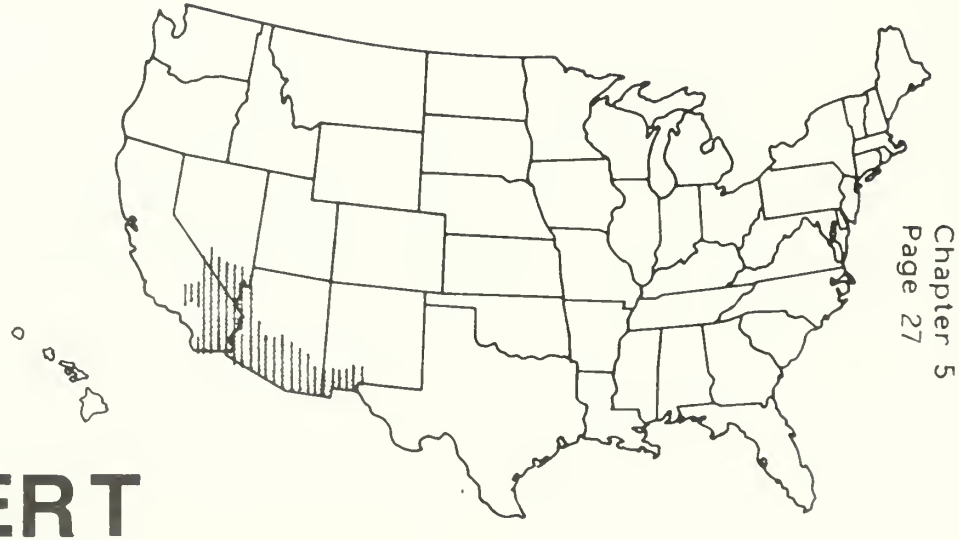


6 ADMIT THE SUN IN THE WINTER Since solar radiation is abundant in the winter, there is great potential for using the sun as the primary heating source in the home South windows should be designed to admit the winter sun, and massive materials should be used to collect and store the heat gain for passive solar heating



7 USE NIGHT VENTILATION TO KEEP HOMES COOL Use nighttime ventilation to exhaust the heat built up in the house during the day Provide attic vents to prevent hot air buildup in the attic

	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT	1			2	4	7	3	
TOO COOL FOR COMFORT	5				4			6
	LIABILITIES				ASSETS			



SOUTHWEST DESERT

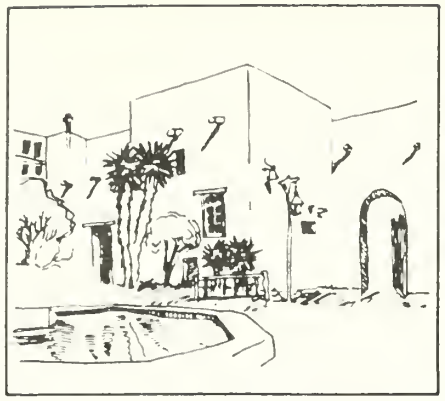
Release No. 2
September 1988

WEST TEXAS AREA

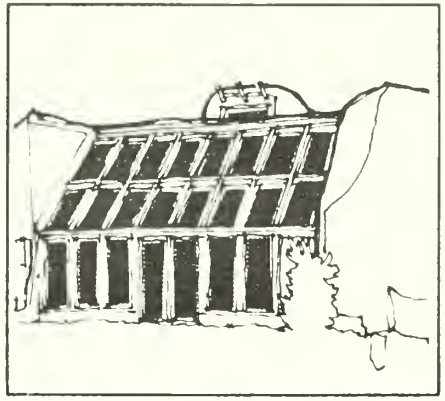
WHAT SHOULD BE BUILT HERE?

In summary, moisture addition in this often overheated climate offers the greatest potential for increased comfort through passive design. The most effective way to achieve this is through evaporative cooling. Landscaping and simple water features such as pools and fountains can contribute significant amounts of humidity to the home and can cool air temperatures. In the cool winter months sunlight plays an important role in comfort and should be considered for maximum heat gain. Site the building to avoid shading the southern exposure, orient within 20° of south, and provide south facing openings to admit the sun. Although the sun is desirable in the winter, the living space must be protected from overheating in the summer with deciduous trees and properly designed overhangs and awnings. Shade east and west elevations with other structures. The building must also be protected against outdoor temperatures which are often too hot or too cold for comfort. Good insulation is critical, while earth berming and underground construction are most effective in providing uniform, moderate temperatures throughout the year. Shutters should be used to protect windows from heat loss. Winds also pose a serious design consideration in this climate, and the properly designed building will avoid infiltration in winter yet allow summer ventilation. Moveable panels are one method of achieving this. Finally, it is possible to even further extend the yearly comfort period by flattening day-to-night temperature swings. Berming, building underground, or using any kind of massive construction will achieve this by absorbing solar energy during the day and reradiating it at night.

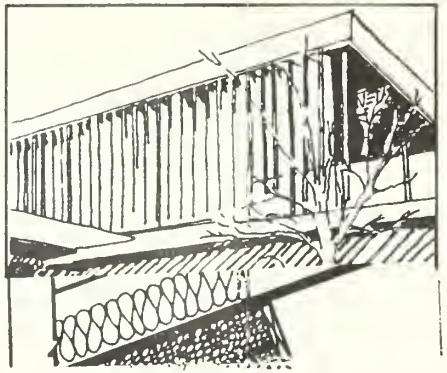
Release No. 2
September 1988

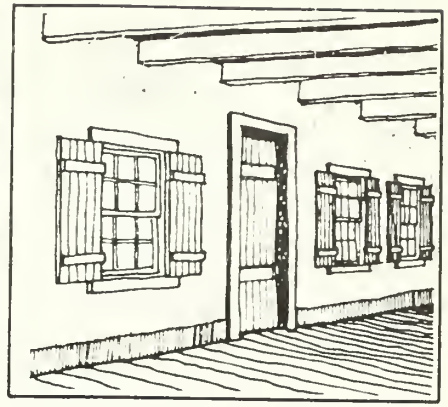


1 ADD MOISTURE TO EVAPORATIVELY COOL WHEN IT'S TOO HOT FOR COMFORT

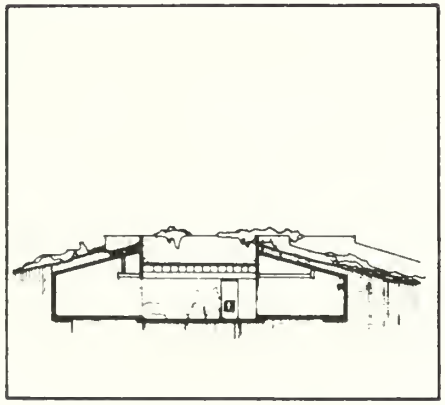


2 LET THE SUNLIGHT IN WHEN IT'S TOO COOL FOR COMFORT



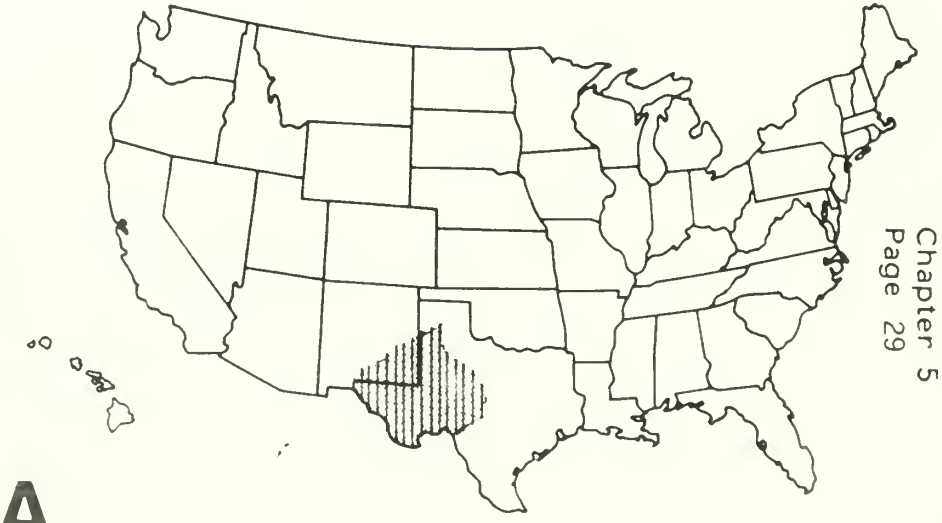


5 &6 PROTECT FROM WINTER WINDS WHEN IT'S TOO COOL FOR COMFORT BUT ALLOW FOR VENTILATION WHEN IT'S TOO HOT FOR COMFORT



4 PROTECT AGAINST OUTDOOR TEMPERATURES WHEN IT'S TOO HOT OR COOL FOR COMFORT

	LIABILITIES				ASSETS			
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT	4			3	7	6	1	
TOO COOL FOR COMFORT	4	5			7			2



WEST TEXAS AREA

NORTH TEXAS AREA

WHAT SHOULD BE BUILT HERE?

The conditions of this climate provide excellent opportunities to reduce significantly heating and cooling loads and to provide natural methods of conditioning for comfort.

An energy-efficient house in this climate uses natural ventilation (or thermally induced ventilation when there is no wind) to provide up to 14% additional comfort a year and to minimize mechanical cooling loads. The energy-efficient house also opens to the sunshine in winter to provide passive solar heating for at least 10% of the year and to minimize the mechanical heating loads.

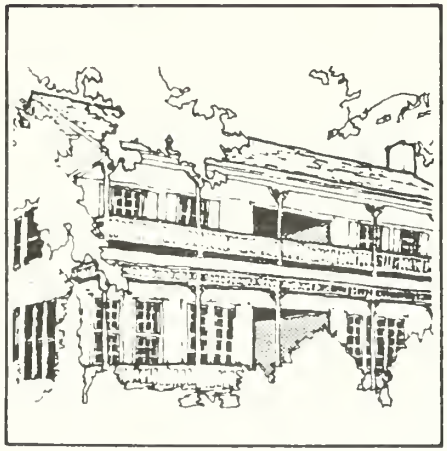
Major design strategies such as the dog-run house, oriented with the long side south to capture both winter sun and summer breezes, can be highly effective.

To minimize climatic liabilities and to conserve energy, devices which can be seasonally adjusted are recommended. South windows for solar heat collection, are combined with shading devices to prevent overheating in summer and with insulated shutters to prevent unnecessary heat loss in winter. Methods for varying the ceiling height to be high in summer for ventilation and low in winter for easy heating are other adaptive strategies. Breezy summer living spaces are provided, while winter living spaces are carefully protected to prevent unnecessary infiltration in winter. Landscaping, orientation, and construction details ensure that winter winds from the north and northwest are kept out of the house while summer winds from the south and southwest are welcomed.

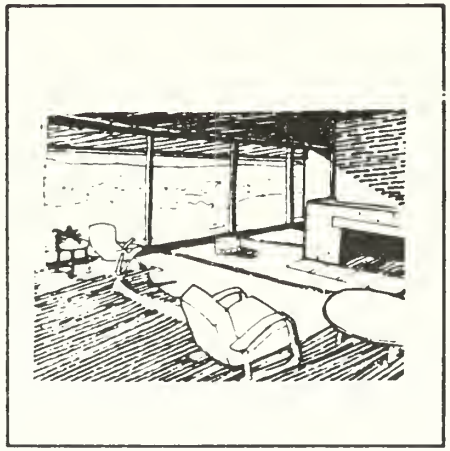
Finally, building for surface exposure to constant ground temperatures. combined with nighttime ventilation, provides effective cooling in summer and reduces heating loads in winter. Combining natural ventilation with evaporative cooling in the dryer periods completes the energy-efficient, passive air conditioning package.

All together, a passive, energy conserving home in this climate can make as much as 40% to 50% of the year comfortable by careful climate-adaptive design.

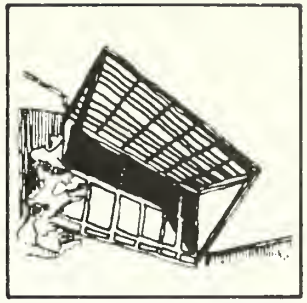
Release No. 2
September 1988



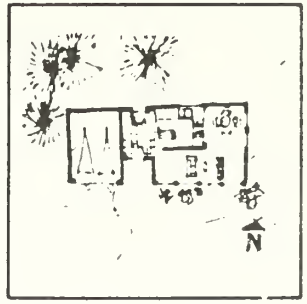
1 USE NATURAL VENTILATION TO COOL WHEN IT'S TOO HOT FOR COMFORT This dog-run house is an historic example of how to maximize air movement around and through the building for natural air conditioning



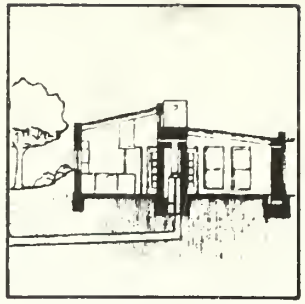
2 LET THE WINTER SUN IN Take advantage of the sun in winter using building orientation shape fenestration and materials to collect and store solar heat Use massive walls and floors to store the sun's energy for passive solar heating



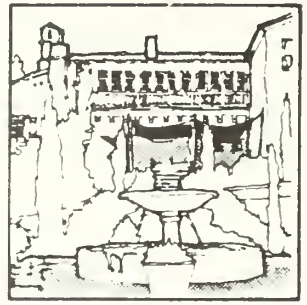
3 BUT KEEP THE SUNSHINE OUT WHEN IT'S TOO HOT FOR COMFORT Solar shading is as important in this region as solar collection since overheating is a significant design problem



4 PROTECT FROM THE COLD WINTER WINDS Use siting building shape and construction to prevent winter infiltration yet allow summer ventilation



5 FLATTEN DAY-TO-NIGHT TEMPERATURE SWINGS FOR NIGHTTIME COOLING

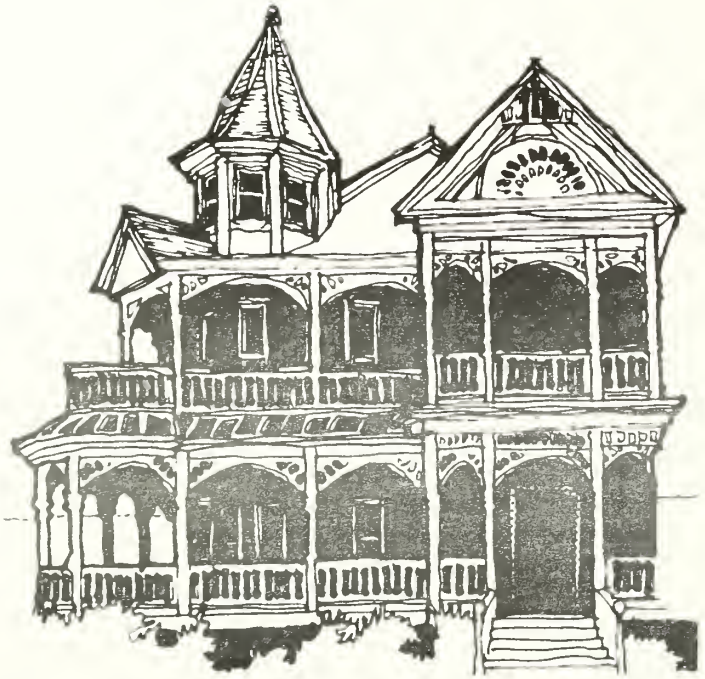


6 COMBINE NATURAL VENTILATION WITH MOISTURE FOR EVAPORATIVE COOLING WHEN ITS DRY

	LIABILITIES				ASSETS			
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT			6	3	5	1	6	
TOO COOL FOR COMFORT		4			5			2

NORTH TEXAS AREA

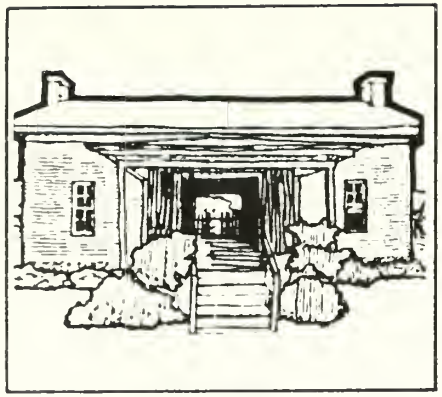
GULF COAST



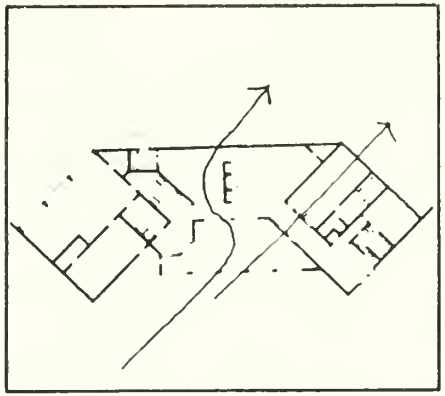
WHAT SHOULD BE BUILT HERE?

Again, this region is quite similar to the Bayou country both in its climate and its traditional architectural responses to climatic stress. Traditional homes tried to use air flow to combat the excessively muggy environment with an emphasis on cross ventilation. They featured high ceilings, attics for roof ventilation, and large, tall stairwells often connected to roof turrets to funnel air up and out even on the stillest of Gulf Coast summer days. Internal air flow was controlled by the use of jalousie windows and transomed doors. Regional design responses, such as in the late Victorian houses, paid careful attention to porches, awnings, and louvered shutters that kept the sun out but allowed the breezes in. All of these were highly appropriate strategies for the climate; only in our recent concern for energy conservation are we slowly rediscovering advantages of these strategies.

In winter, substantial sunshine is available and can be a reliable source of winter heating if care is taken to ensure that it does not cause overheating during the summer. By combining all of these building strategies with carefully designed outdoor spaces, it is possible to attain natural comfort for as much as 32% of the year.

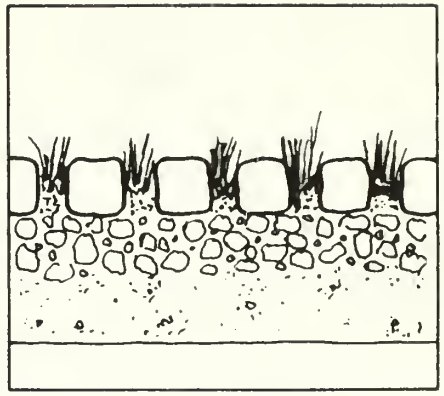


1 ISOLATE THE HOUSE FROM HOT SUMMER TEMPERATURES Place heat and moisture-producing rooms away from the living spaces and away from the prevailing summer winds

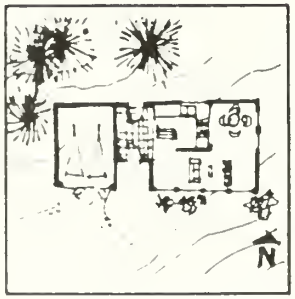


2 ENCOURAGE CROSS VENTILATION FOR NATURAL COOLING Open plans are a prerequisite for good ventilation

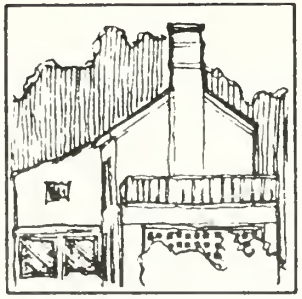
3 PROTECT FROM THE SUMMER SUN All wall and window surfaces must be as well-shaded as possible with roofs overhangs porches and vegetation



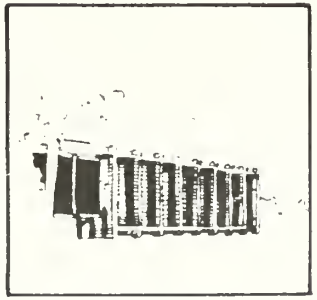
4 AVOID CREATING ADDITIONAL HUMIDITY Prevent standing water in puddles or pools exposed to the sun Subsurface or drip irrigation should replace the use of lawn sprinklers if possible



5 ALLOW FOR SUMMER VENTILATION BUT PREVENT WINTER INFILTRATION

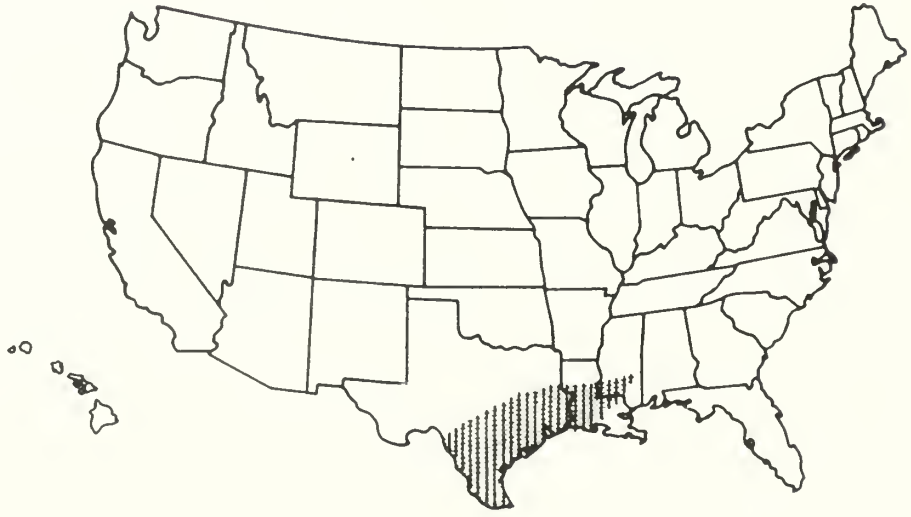


6 LET THE SUN IN AT SELECTED TIMES



7 AVOID EXPOSURE TO OUTSIDE TEMPERATURES WHEN IT S TOO HOT OR TOO COOL FOR COMFORT

	LIABILITIES				ASSETS			
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT	1		4	3		2		
TOO COOL FOR COMFORT	7	5						6



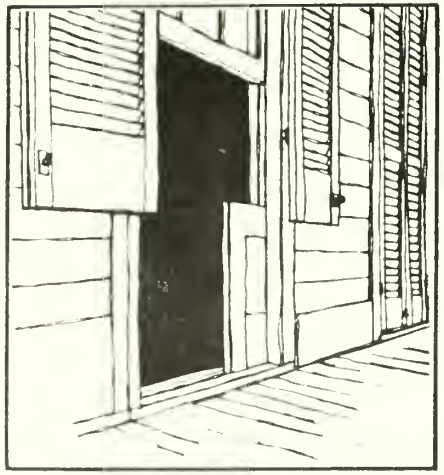
GULF COAST

BAYOU COAST

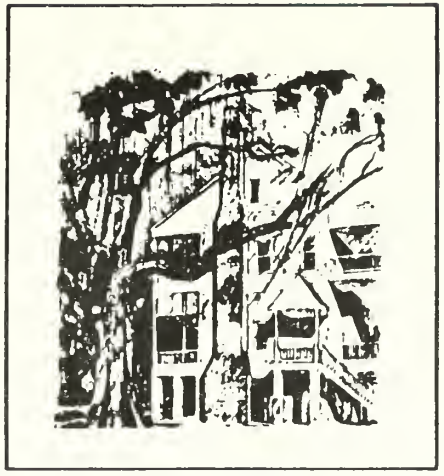
WHAT SHOULD BE BUILT HERE?

In summary, building sites or lots should be large enough to permit ventilation through and around open-plan houses. The building plan should facilitate cross ventilation with openable windows, louvers, and sliding glass doors. These should be well-shaded from the summer sun. The addition of wings is preferred to compact floor plans. On those sites where the night temperatures are significantly cooler than those of the daytime, consideration should be given to the use of massive construction in order to delay daytime heat gain until the cooler hours at night. Fans and dehumidifiers are the least expensive devices for mechanically air conditioning the living spaces. These are the primary energy conserving solutions.

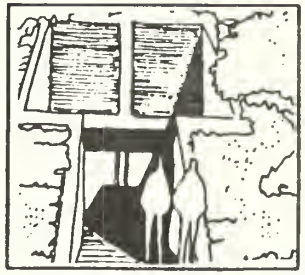
Some control for reducing air flow around and through the building should be considered for the cooler months. South facing windows or heat storage walls which are open to the winter sun but protect from the sun in summer are solar heating devices which are appropriate for this climate. Prevention of winter air movement and the acceptance of winter sun are the secondary energy conservation solutions.



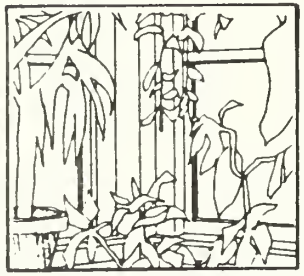
1 & 6 ALLOW WINDS TO VENTILATE Design for maximum ventilation, which is an asset 50% to 65% of the year, but beware of uncontrolled air movement (infiltration), a liability 20% to 45% of the year



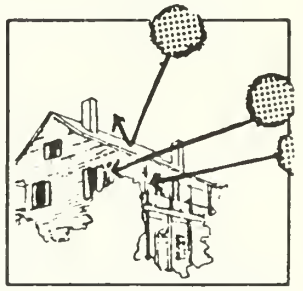
2 KEEP THE SUNLIGHT OUT Sunshine is a liability from 60% to 75% of the year, causing excessive air conditioning because of overheating



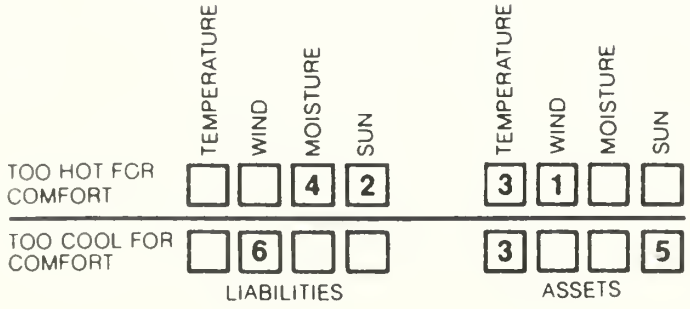
3 USE MASS TO TEMPER LARGE DAY-TO-NIGHT TEMPERATURE SWINGS

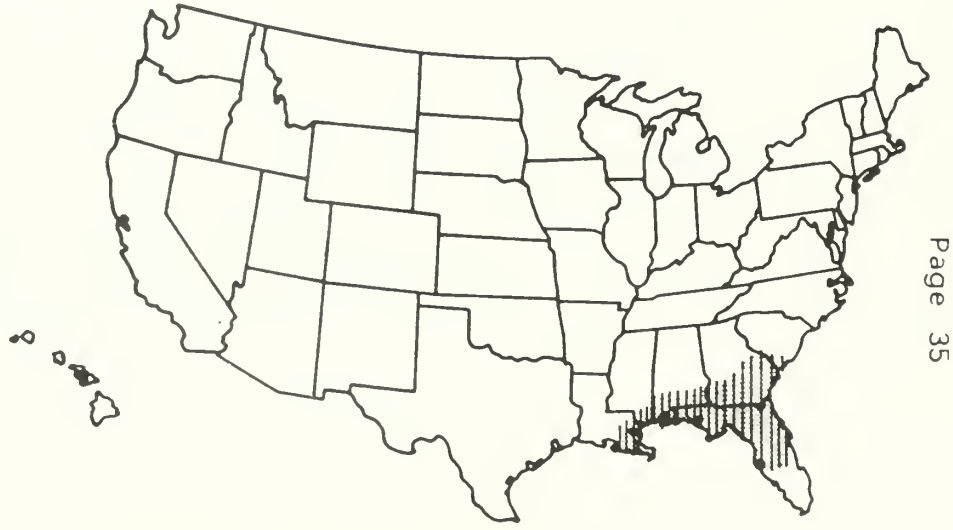


4 AVOID CREATING MORE HUMIDITY



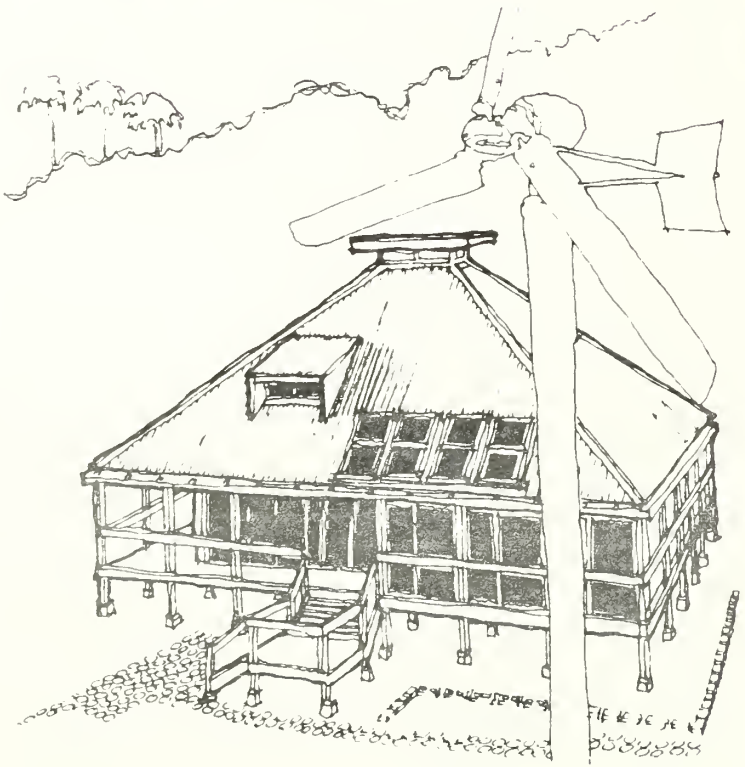
5 LET THE SUN SHINE IN On winter days letting the sunlight in for passive daytime and nighttime heating can be an asset 20% to 40% of the year





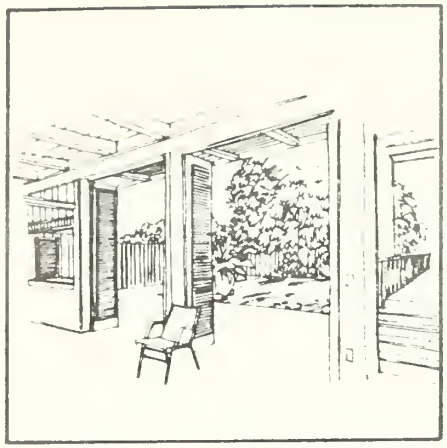
BAYOU COAST

TROPICS

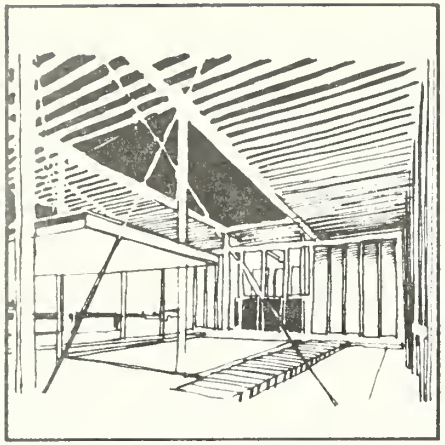


WHAT SHOULD BE BUILT HERE?

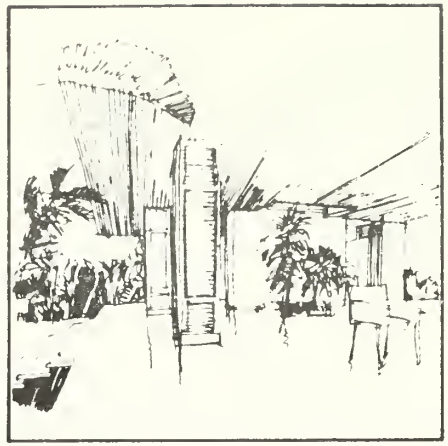
Most important in this climate is to maintain the comfort balance by not adding heat in summer or losing heat in winter. Pavilion-like buildings with thin or movable walls and outdoor living spaces offer the best year-round living. Building sites should be well-shaded and large enough to allow air movement through and around these open plan houses. The building plan should also optimize cross ventilation with openings placed on opposite sides of rooms. Although walls and openings should be operable for ventilation, they must be shielded from the summer sun by shading devices, overhangs, or proper northern orientation. Avoid creating additional humidity with fountains, pools, or plants placed in the path of incoming wind. During the few cool periods of the year, let the sunlight in through well-placed windows to provide natural solar heating, being sure to shade these openings from summer heat gain. All in all, climatic responsive design, which includes such passive technologies as induced ventilation and dehumidification devices, offers the least expensive cooling solution, while indirect gain solar systems offer the best heating alternative for achieving a 100% naturally conditioned home.



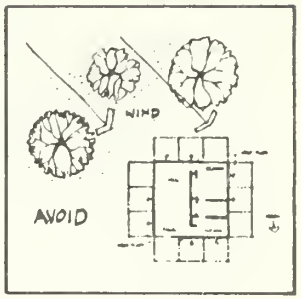
1 BUILD FOR EXPOSURE TO THE PLEASANTNESS OF A COMFORTABLE CLIMATE Fifty to eighty percent of the year is comfortable outside



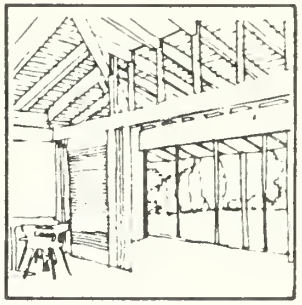
2 KEEP OUT THE SUN Solar heat gain is a liability most of the year causing unnecessary overheating Extensive roofing provides sun protection and shaded outdoor living spaces



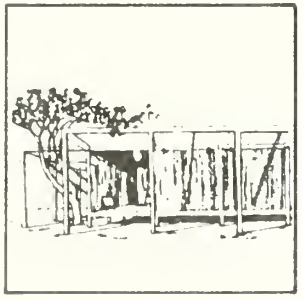
3 ALLOW WINDS TO VENTILATE AND COOL Use pavilion-like open plan buildings to maximize air movement Louvered shuttered or hinged walls allow for excellent cross ventilation



4 AVOID CREATING ADDITIONAL HUMIDITY



5 LET THE SUNLIGHT IN AT SELECTED TIMES



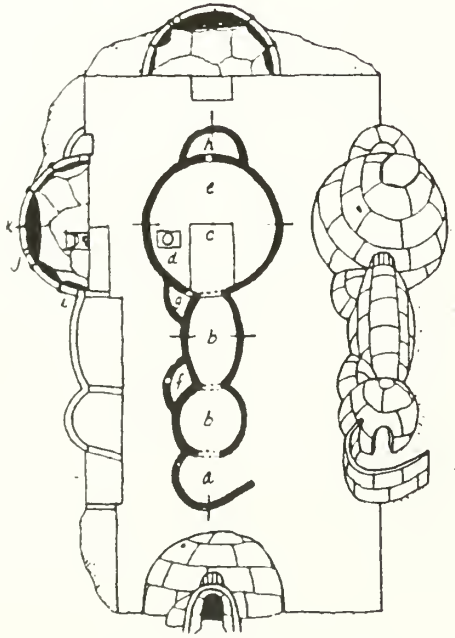
6 AVOID EXPOSURE TO OUTSIDE TEMPERATURES WHEN IT S TOO HOT OR TOO COOL FOR COMFORT

	LIABILITIES				ASSETS			
	TEMPERATURE	WIND	MOISTURE	SUN	TEMPERATURE	WIND	MOISTURE	SUN
TOO HOT FOR COMFORT	6	2		4			3	
TOO COOL FOR COMFORT	6					5		
COMFORTABLE					1			

TROPICS

ALASKA

WHAT SHOULD BE BUILT HERE ?



igloo spaces: (a) entry, (b) tunnel, (c) main room. (d) cooking. (e) rest. (f-h) three storage spaces. (i) window. (j) vent. (k) air space.

The construction of passive energy-conserving homes in Alaska must recognize that Alaska has four distinct climatic zones. Airtightness and adequate insulation are important strategies for each of these zones but must work in concert with the ground movement generated by local frost and seismic activity. The following information from the *Alaska Craftsman Home Building Manual* provides an overview of some of these planning considerations for Alaskan housing, but in no way is it intended to replace the knowledge of arctic engineering required for detailed design.

The first step in the process of good passive design involves the proper placement of the house on the site. The largest window area should face in a southerly direction, comprising up to 50 to 60 percent of the total window area of the house. Orientation within 30 degrees east or west of south is acceptable; any further deviation may lead to penalties in reduced solar gain and increased problems of overheating during the summer (see figures 1 and 2). Requirements for ventilation and views may, of course, temper these design guidelines. Because of the low sun during the Alaskan winter, a house on a north slope is prone to shading. Therefore, a south slope is preferable.

Typically, in an energy-efficient house, non-south-facing orientations are reduced to the minimum required by the building code. The use of the new generation "super-windows" will help to reduce the energy penalty associated with windows.

Sloped glass and skylights should be avoided in energy-efficient houses. They work very poorly as passive solar devices, because they cause summer overheating and high winter heat losses. A vertical window, especially with ground-reflected light, will capture as much or more solar energy than sloped glass.

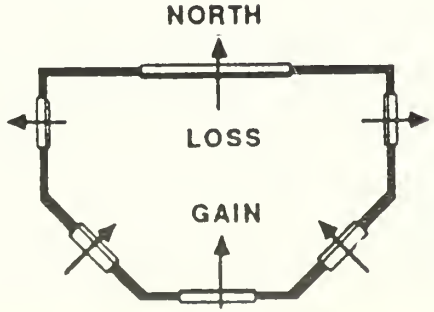


Fig. 1 Energy Flow Through Double-Glazed Windows

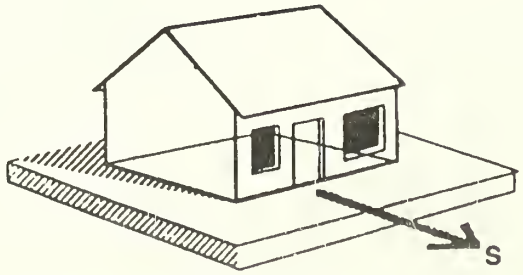


Fig. 2 South Glass Area No more than 6-9% of liveable floor space can be south facing glass or overheating may result

A compact shape will minimize the heat losses from the building. This implies a close-to-square plan, although extending the building sightly along the east-west axis is beneficial in terms of solar gains. Two stories are more efficient than a single story. However, in many cases, these conditions are neither possible nor desirable because of other site and market constraints. They are, nevertheless, useful concepts to keep in mind. Further, buildings with an excessive number of corners or overhangs will cause extra detailing work and can increase substantially the surface area of exterior walls.

Locate the rooms that most benefit from solar heating on the south side. This usually means that living spaces (living room, family room, den, breakfast area) should, if possible, be on the south side, while rooms used infrequently (bedrooms, bathrooms, hallway), or rooms with high inherent internal gains (kitchen, laundry room) should be positioned away from the south side (see figure 3).

The natural lighting requirements of spaces should also be a consideration when orienting rooms. Rooms on the south side of a building have a highly variable natural light level, and glare problems may have to be remedied with some sort of sun control device (drapes, blinds, etc.). Summer shading may be required for east-, south- and, specifically, west-facing windows.

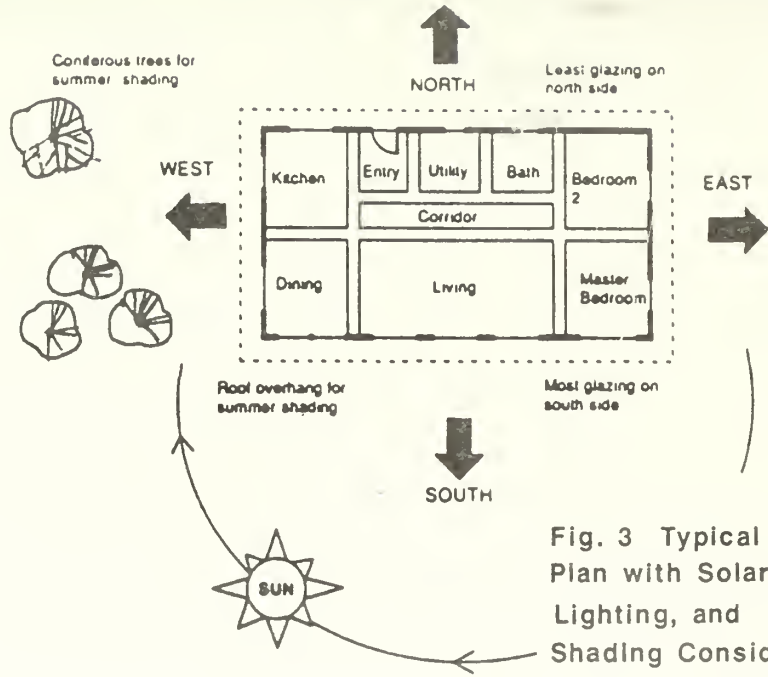


Fig. 3 Typical House Plan with Solar, Lighting, and Shading Considerations

ALASKAN CLIMATIC ZONES

With regard to energy-related design features, weather is obviously the most important regional determinant. Alaska has four major climatic zones – maritime, transition, continental, and arctic (figure 4).

Maritime Zone

The maritime zone includes southeast Alaska, a narrow band along the north coast of the Gulf of Alaska, and the south side of the Alaska Peninsula, and the Aleutian Islands. Weather in the maritime zone is moderated by ocean influence. Compared to other zones, summers are cool and winters are warm. Precipitation is generally heavy, and strong surface winds persist in most areas.

Transition Zone

The transition zone consists of a band of varying width between the maritime and continental zones. Typical weather in the transition zone is between maritime and continental; temperatures are more extreme than in the maritime, but less than in the continental zone. Surface winds are generally light but there are numerous exceptions.

Continental Zone

The continental zone covers interior Alaska south of the central Brooks Range and inland from the coastal maritime zone. Generally, both summer and winter temperatures are extreme and precipitation is moderate. Except for a few isolated locations, surface winds are light.

Arctic Zone

The arctic zone extends from the central ridgeline of the Brooks Range north to the Arctic Ocean. The climate is characterized by low temperatures and light precipitation. Surface winds are strong along the coast but decrease further inland. Because of the nearly continuous frozen condition of the Arctic Ocean, maritime or transition zones have been designated along the arctic coast.

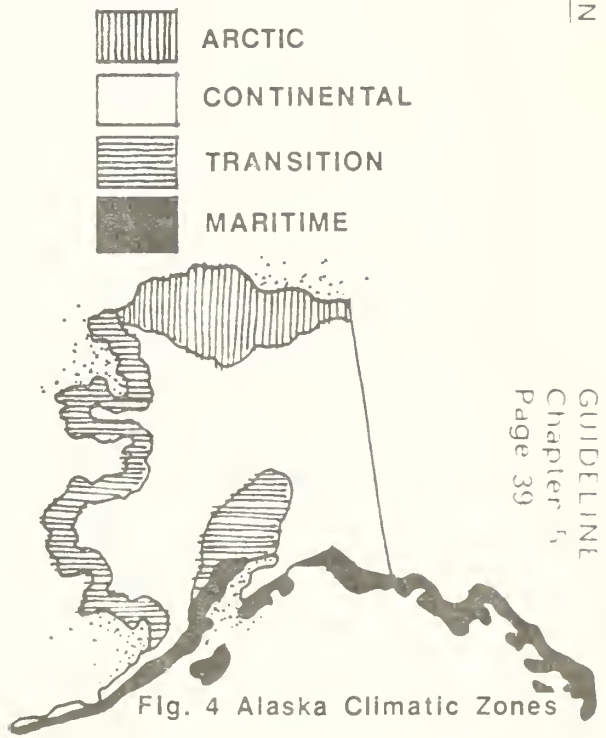


Fig. 4 Alaska Climatic Zones

ALASKA

The fine-tuning of appropriate design for a particular park or climatic environment requires consideration of the prevailing design statement of site and building materials as well as the scrutiny of material and product performance under the rigors of use and climate exposure.

This chapter is appended with the 16-division format of the Construction Specifications Institute (CSI) and is intended to facilitate the cataloging by the designer of successful and compatible materials and products for a given park environment.

1. GENERAL DATA

3. CONCRETE

4. MASONARY

5. METALS

6. WOOD / PLASTICS

8. DOORS / WINDOWS

9. FINISHES

10. SPECIALTIES

11. EQUIPMENT

12. FURNISHINGS

13. SPECIAL CONSTRUCTION

14. CONVEYING SYSTEMS

15. MECHANICAL

16. ELECTRICAL

Two manuals (reproduced in this chapter) are provided for asssitance in the preparation of class "C" estimates--one for regular construction, and the other for historic preservation and stabilization. Although class "C" means conceptual cost data, the costs for the individual items listed were compiled by averaging actual construction bid abstracts obtained over a long period of time.

As nationwide averages, the cost figures in these manuals should only be used as a rule-of-thumb. Factors, such as remoteness of job location, material suppliers, labor availability and wage rates, season of construction, geographic location, and difficulty of terrain, must be assessed for each park. A remote location can increase construction costs 15-35 percent for parks in the contiguous states and 50-100 percent for Alaska and Hawaii.

The average unit cost of housing is also increased when only a few units are built at one time. Small-scale housing projects preclude volume discounts on materials and the efficient scheduling and rotation of skilled labor crews from one house to the next.

Additionally, bid prices will be increased if a contractor foresees overtime or downtime due to restrictions caused by park operations, visitor activities, concession operations, climate conditions, or season of construction.

The cost information contained in the two estimating manuals reflects construction cost only and does not include planning, design, or project supervision costs. Prices in the estimating manual for historic preservation do not reflect the cost of period restoration due to the complexity of each project and lack of information for the scope of work.

ESTIMATING COST FOR LEGISLATIVE SUPPORT DATA (PERCENT)

1.	Construction costs, material and labor	100%
2.	Advance planning	15%
3.	Project planning - plans, drawings, engineer surveys, etc.	15%
4.	Construction supervision	15%
5.	Facilitating administrative services	16%
	TOTAL PERCENTAGE (LSD)	161%

1.		
	Material	35%
	Labor	35%
	Profit & Contingencies	10%
	OH Field Supervision	2.5%
	Main office	8%
	Tools & Equipment	0.5%
	Workman's Compensation	2.5%
	Field Office	0.5%
	Performance Bond	1%
	Federal & State Unemployment Insurance	1.7%
	Social Security & Medical Benefits	2.5%
	Builder's Risk Insurance	0.3%
	Public Liability Insurance (property damage)	0.5%
	TOTAL	100%
	Strike cost and wage increase cost	____
	OSHA requirement costs	____
4.	Project supervision	90%
	Office Project supervision	7%
	As built drawings	1%
	Follow through Maint. Inspection	2%
	TOTAL	100%

2.		
	Surveys	30%
	Comprehensive design (design development	30%
	Utility negotiations	5%
	Special studies	3%
	Historic furnishing report	2%
	Historic structures report & architectural report	20%
	Archeological research	10%
	TOTAL	100%
3.	Const. drawings & specifications (contract award)	80%
	Archeological salvage	8%
	Exhibit design	5%
	Audiovisual design	2%
	Engineering surveys	5%
	TOTAL	100%
5.	Administrative services	8%
	Override	8%
	Contingencies	84%
	TOTAL	100%

NATIONAL PARK SERVICE

PREPARED BY DENVER SERVICE CENTER

BRANCH OF ESTIMATING

OCTOBER 1986

THESE COST FIGURES ARE TO BE USED FOR
FUTURE YEARS -- NOT TO EXCEED

OCTOBER 1989

CLASS "C" ESTIMATING ONLY

Note: The following 11 pages are a copy of the above manual.

CLASS "C" ESTIMATING

BUILDING & STRUCTURES

Apartments	40,000/unit
Contact station/Ranger res. (standard) 700 sq. ft.	105,000/each 150/sq. ft.
Dormitory	80/sq. ft.
Duplex residence, 2-bedroom units	57,000/each unit
House trailer	25,000/each
Residence, standard 3-bedroom (1,300 sq. ft.)	100,000/each
Attached garage	10,000/each
Solar heat with backup system	15,000/residence
Shower and laundry building	120/sq. ft.
Storage building	55/sq. ft.
Trailer court with utilities	12,000/unit
Air-condition house	4/sq. ft.
Apartment - furnishings-efficiency (400 sq. ft.)	3,500/unit
Apartment - furnishing-1-bedroom (700 sq. ft.)	3,500/unit
Apartment - furnishing-2-bedroom (900 sq. ft.)	5,000/unit
Apartment - furnishing-3-bedroom (1,100 sq. ft.)	6,000/unit
For dining room add	2,000/unit
Appliance and accessories (residential): washing machine, dryer, refrigerator, range, curtain rods, storm doors, storm windows and screens	5,000/each residence

BUILDING & STRUCTURES (CONTINUED)

Building demolition	.25/cu. ft.
Burglar alarm	3/sq. ft.
Rehabilitation - Electrical System	6/sq. ft.
Fire alarm (detection)	3/sq. ft.
Rehabilitation of building interiors:	
To living quarters	65/sq. ft.
To historic period	120/sq. ft.
(with structural problems add $30/sq. ft.)	
Site restoration after building removal	5/sq. ft.
Roofing replacement	
Built-up (T&G)	450/square
Solar heating and cooling system	60/sq. ft. of bldg.
Solar heating and cooling panels	160/sq. ft.
Storm door/windows	3,000/residence
Scaffolding	.50/sq. ft. bldg.

CAMPGROUNDS

RV site - Road, Parking, & Utilities	16,000/per site

CONCRETE ITEMS

Curbing	22/lin. ft.
Curbing (granite)	22/lin. ft.
Curb (slate)	40/lin. ft.
Curb & gutter (concrete)	24/lin. ft.
Drop inlet (concrete)	2,800/each

CONCRETE ITEMS (CONTINUED)

Footings (concrete)	300/cu. yd.
Parking barrier (precast concrete)	75/each
Paving, 6" reinforced concrete	80/sq. yd.
Removal of concrete slab - 4"	8/sq. yd.
Sidewalk, colored concrete (4") with base (4")	50/sq. yd.
Sidewalk, concrete (4") with base (4")	45/sq. yd.
Steps, concrete (4'-6')	24/lin. ft.
Walls, formed, concrete reinforced	1,000/cu. yd.

ELECTRICAL

Electric meter & pedestal	1,000/each
Electrical power, underground cable	12/lin. ft.
Electrical power-overhead (to be removed)	2/lin. ft.
10 KW generator and shelter	20,000/each
Parking lot lighting 40' pole every 300 feet	2,000/per pole
Trail lighting 6' pole every 50 feet	600/per pole
Pull boxes (large)	1,000/each
Well electrical cable	5/lin. ft.
Solar Photovoltaic	75/watts peak

FENCE

Chain link 42"	12/lin. ft.
Chain link 6'-0" with 3-strand barbed wire	20/lin. ft.
Chain link 12'-0" with 3-strand barbed wire	30/lin. ft.
Picket fence	12/lin. ft.
Rail (3)	12/lin. ft.
Rail (2)	10/lin. ft.
Screen board, 8' high	12/lin. ft.
Screening - colored lath	5/lin. ft.

GAS

3/4" gas meter and regulator	500/each

L.P. GAS

500 gallon L.P. tank	2,000/each
1,000 gallon L.P. tank	3,000/each
2,000 gallon L.P. tank	5,000/each

WRAPPED BLACK IRON PIPE

3/4"	9/lin. ft.
1"	10/lin. ft.
1-1/4"	11/lin. ft.
1-1/2"	12/lin. ft.
2"	14/lin. ft.
2-1/2"	16/lin. ft.
3"	18/lin. ft.
4"	19/lin. ft.

LANDSCAPING

Apartment/unit	1,000/lump sum
Residence	3,000/acre
Residential driveway and sidewalk	2,500/each
Seeding, fertilizer, and mulch	150/per unit of 1,000 sq. ft.
Seeding, trees, and shrubs	6,500/acre
Shrubs (small)	75/each
Sprigging Bermuda Grass, 8"-12" o.c.	100/per unit of 1,000 sq. ft.
Sprinkler system, 30 heads/acre	200/head 7,000/acre
Sprinkler system, small lawns	0.70/sq. ft.
Topsoil	20/cu. yd.
Topsoil and sod (2")	9/sq. yd.
Trailer	600/lump sum
Trees (small)	250/each

ROADS, TRAILS AND SITEWORK

Clearing and grubbing	2,000/acre - sparse 7,000/acre - medium 12,000/acre - heavy
Site preparation	3/sq. yd.
Unclassified excavation	12/cu. yd.
Structural excavation	30/cu. yd.
Base grading, complete	6/sq. yd.
Base course - haul	0.40/ton-mile 0.50/cy. yd. - mile
Imported borrow	14/cu. yd.
Base course (6")	22/ton 6/sq. yd.
Watering for compaction	1,000/gal. unit/$20
Petro Mat	3/sq. yd.
Prime asphalt	300/ton
2" asphalt mat	85/ton 10/sq. yd.
Asphalt cement for plant mix	300/ton
Seal asphalt	300/ton
MC 70 Prime	3.00/gallon
MC 250 Prime	3.00/gallon
Chips	70/ton
Seal & chip (22'-0" wide)	40,000/mile 2.50/sq. yd.
Seal & chip with rubberized seal (25% rubber)	6/sq. yd.
Striping (4" wide)	.80/lin. ft.

ROADS, TRAILS AND SITEWORK (CONTINUED)

Guard rail (metal)	20/lin. ft.
Asphalt curb	10/lin. ft.
Informational sign (small)	125/each
Directional sign	200/each
Aluminum sign	5/sq. ft.
Road - asphalt	500,000/mile (average conditions)
Road - gravel surface	250,000/mile 16/sq. yd.
Resurface roads (site preparation, tack coat, 2" met, seal and chip)	22/sq. yd.
Road obliteration (asphalt & base)	8/sq. yd.
Road obliteration and restoration	11/sq. yd.
Cattle guard with concrete wall 36' wide	18,000/each
Cattle guard with concrete wall 24' wide	15,000/each
Trail, asphalt	20/sq. yd.
Trail, bike (10' wide)	100,000/mile
Bike rack	400/each
Trail, foot	15,000-46,000/mile
Parking area (paved) (small-25 cars)	1,600/per car
Parking area (gravel)	800/space
Parking area (stabilized turf)	800/space
Parking barriers (concrete) 6'	70/each
Parking barriers (timber) 6'	40/each
Paved ditch (asphalt, 2'-0" wide)	15/lin. ft.

ROADS, TRAILS AND SITEWORK (CONTINUED)

8" CMP (corrugated metal pipe)	24/lin. ft.
8" end sections	135/each

SEWAGE SYSTEMS

Leaching field in 3'-0" wide trench	22/lin. ft.
Plastic liner pipe	12/lin. ft.
T.V. pipe inspection	2.00/lin. ft.
Septic tank - 1,000 gallon	3,500/each
Septic tank - 2,000 gallon	5,000/each
Septic tank - 3,000 gallon	9,000/each
Sewage distribution box	2,000/each

WATER SYSTEMS

Chlorinator	1,800/each
Curb stops - 1"	350/each
Drill well, casing and testing	
6" diameter	50/lin. ft.
8" diameter	55/lin. ft.
10" diameter	60/lin. ft.
Drinking fountain (park type)	2,200/each
Drinking fountain (camp type)	1,800/each
Firehose cabinets	4,000/each
6" fire hydrant with valves and connections	2,600/each
4" D.I. (Ductile iron pipe)	25/lin. ft.

WATER SYSTEMS (CONTINUED)

6" D.I. pipe	30/lin. ft.
8" D.I. pipe	34/lin. ft.
10" D.I. pipe	42/lin. ft.
12" D.I. pipe	52/lin. ft.
3/4" galvanized steel pipe	14/lin. ft.
1" galvanized steel pipe	16/lin. ft.
1-1/2" galvanized steel pip	17/lin. ft.
2" galvanized steel pipe	18/lin. ft.
2-1/2" galvanized steel pipe	19/lin. ft.
3" galvanized steel pipe	20/lin. ft.
1" P.V.C. (Poly Vinyl Chloride)	13/lin. ft.
2" P.V.C.	15/lin. ft.
3" P.V.C.	17/lin. ft.
4" P.V.C.	18/lin. ft.
6" P.V.C.	24/lin. ft.
8" P.V.C.	28/lin. ft.
Pipe jacking (12" to 18")	180/lin. ft.
6" Plug valve w/box	1,000/each
8" Plug valve w/box	1,200/each
Pump house 10' x 10' and equipment	60,000/each
Pump house, masonry	80/sq. ft.
Steel Water Storage Reservoir:	
10,000 gallon	25,000/each
20,000 gallon	35,000/each
50,000 gallon	70,000/each
100,000 gallon	145,000/each
200,000 gallon	210,000/each

WATER SYSTEMS (CONTINUED)

Elevated Steel H_2O Storage Tank:	
10,000 gallon	135,000/each
20,000 gallon	145,000/each
30,000 gallon	160,000/each
40,000 gallon	170,000/each
50,000 gallon	200,000/each
Steel water tank (clean & paint)	
outside	2/sq. ft.
inside	2.50/sq. ft.
Sand blasting	2.50/sq. ft.
Sand blasting and painting	4/sq. ft.
1" Gate Valves w/box	250/each
2" Gate Valves w/box	300/each
3" Gate Valves w/box	450/each
4" Gate Valves w/box	550/each
6" Gate Valves w/box	800/each
8" Gate Valves w/box	900/each
Water Meter & Box:	
3/4" meter and box	400/each
1" meter and box	500/each
2" meter and box	600/each

MISCELLANEOUS ITEMS

Benches (6'-8') wood	800/each
Benches (6'-8') concrete	1,000/each
Gabions - stones (3' x 3' x 3')	200/cu. yd.
Clothesline	125/each
Flag poles	3,500/each
Log replacement (6"-20" diameter)	30/lin. ft.

MISCELLANEOUS ITEMS (CONTINUED)

Rubble removal	9/ton
Tree removal	200/tree
Utility connections (100 lin. ft.)	2,000/each
Brick wall	9/sq. ft.
Stone wall	500/cu. yd.

HISTORIC PRESERVATION AND STABILIZATION

CLASS "C" ESTIMATING MANUAL

NATIONAL PARK SERVICE

PREPARED BY DENVER SERVICE CENTER

BRANCH OF ESTIMATING

OCTOBER 1988

THESE COST FIGURES ARE TO BE USED FOR
FUTURE YEARS -- NOT TO EXCEED

OCTOBER 1990

HISTORIC CLASS "C" ESTIMATING

DEMOLITION

ASBESTOS ABATEMENT

PIPE SIZES

3/4 inch	$	4.00/LIN. FT.
1 inch		5.00/LIN. FT.
2 inch		6.00/LIN. FT.
3 inch		6.50/LIN. FT.
4 inch		7.00/LIN. FT.
6 inch		10.00/LIN. FT.
8 inch		13.00/LIN. FT.

BEAM SIZE

W12 x 22	10.00/LIN. FT.
W16 x 31	15.00/LIN. FT.
W24 x 55	20.00/LIN. FT.

REMOVAL

Ceiling Removal	6.00/SQ. FT.
Wall Removal	5.00/SQ. FT.
Replacement Materials Sprayed On	4.00/SQ. FT.

ENCAPSULATION

Ceiling & Walls	2.00/SQ. FT.
Columns & Beams	1.75/LIN. FT.
Pipes	2.00/LIN. FT.

AIR SAMPLING		
Minimum	$	350.00/Project
Maximum		1,200.00/Project
Enclosure Chamber (Does not include Portable Showers)		800.00/Each
Dust Protection - 6 Mil Polyethylene		1.00/SQ. FT.
Tape, Protective Wear & Misc. Supplies		.75/SQ. FT.
Respirators - Half Face		50.00/Each
EXTERIOR DEMOLITION		
Roofing Material (Build Up)		140.00/SQ.
Roofing Material (Shingles)		1.00/SQ. FT.
Stone		5.00/CU. FT.
Fencing (Wood)		2.50/LIN. FT.
Foundation, Concrete		12.00/CU. FT.
INTERIOR DEMOLITION		
Ceiling		1.00/SQ. FT.
Plaster		1.50/SQ. FT.
Wood: Moulding and Baseboard		.75/LIN. FT.
T & G Siding		2.00/SQ. FT.
Floor		2.00/SQ. FT.
Doors		15.00/Each
Interior Framing		2.50/LIN. FT.
Electric Fixtures - Wall Hung		15.00/Each
- Ceiling Hung		20.00/Each
Gutting Interior		5.00/SQ. FT.

EXTERIOR WORK

ROOF

Clay Tile - Replace	$	900.00/SQ.
- Repair (prices vary according to color and style)		12.00/SQ. FT.
Slate 1/4 inch - Replace		900.00/SQ.
- Repair		10.00/SQ. FT.
Wood Shingles - Replace		300.00/SQ.
- Repair		5.00/SQ. FT.
Stainless Steel 26 Gauge - Replace		600.00/SQ.
- Repair		7.00/SQ. FT.
Lead or Tern Coated Add 30%		
Copper 20 oz. Standing Seam - Replace		800.00/SQ.
- Repair		9.00/SQ. FT.
Add for Lead Coated 30%		
Build Up Roof - Replace		400.00/SQ.
- Repair (5 Ply - Tar and Gravel)		5.00/SQ. FT.
Lead Roofing - Replace		800.00/SQ.
- Repair		9.00/SQ. FT.

GUTTERING/DOWNSPOUTS

Copper - 16 oz. 4 inch	9.00/LIN. FT.
16 oz. 5 inch	10.00/LIN. FT.
16 oz. 6 inch	11.00/LIN. FT.
Lead Coated Add 30%	
Galvanized Steel - 28 ga. 5 inch	7.00/LIN. FT.
- 26 ga. 5 inch	7.50/LIN. FT.
- 26 ga. 6 inch	8.00/LIN. FT.
Wood Gutter	20.00/LIN. FT

FLASHING		
Copper - 16 oz.	$	8.00/SQ. FT.
- 20 oz.		9.00/SQ. FT.
- 24 oz.		10.00/SQ. FT.
- 32 oz.		11.00/SQ. FT.
Lead Coated Copper Add 30%		
Tern Coated Stainless Steel - 28 ga.		8.00/SQ. FT.
- 26 ga.		9.00/SQ. FT.
SHEATHING AND WATERPROOFING		
T & G - Replace		5.00/SQ. FT.
Strip - Replace		4.00/SQ. FT.
Solid (Plywood) - Replace		4.00/SQ. FT.
Felt Paper (Asphalt Coated) - 15 lb.		15.00/SQ.
- 30 lb.		20.00/SQ.
BRICK WORK		
Needle Masonry		600.00/Each
Raking Masonry - Hand (Soft Mortar)		8.00/SF. FT.
- Hand (Hard Mortar)		10.00/SF. FT.
Repointing		8.00/SF. FT.
Removal and Replacement of Damaged Brick		40.00/SF. FT.
Brick Walk and Driveway - Modern (on 4 inch Concrete Slab)		10.00/SQ. FT.
Dry Layed (Sand Bed) - Hist.		15.00/SF. FT.
Install Z Bar Wall Ties/(Removal and Replacement of Brick)		60.00/Each
Adobe Brick - 10 inch (Hand Made)		1.25/Each
Replace Lintels		75.00/LIN. FT.

STONE WORK

LIMESTONE

Epoxy Patch for Cracks in Walls	$	45.00/LIN. FT.
Repair of Deteriorated Stone		250.00/SQ. FT.
Replacement of Stone (Walls and Floor)		250.00/CU. FT.

SANDSTONE

Veneer Panels	15.00/CU. FT.
Stair Treads - 2 inch thick approximately	25.00/SQ. FT.
Sills - 6′ x 10" x 12" approximately	25.00/LIN. FT.

ROUGH STONE (Field Stone)

Wall	25.00/CU. FT.
Fireplace	20.00/SQ. FT. of face

GRANITE

Stone Replacement	500.00/CU. FT.
Stain Removal	10.00/SQ. FT.
Dismantling of Stone (2 Story) - (2,000 lb.)	1,200.00/Each
Resetting of Stone and Anchoring (2,000 lb.) (2 story)	1,800.00/Each

REPOINTING OF STONE

Repointing	8.00/SQ. FT.
Pressure Grouting	27.00/SQ. FT.
Epoxy Injection	45.00/LIN. FT.

MASONRY CLEANING and TESTING OF EACH PROCESS

Mild Soap/Water	$ 3.00/SQ. FT.
Chemical (Water must be prevented from entering drainage or percolating into ground)	8.00/SQ. FT.
High Pressure Water	3.50/SQ. FT.
Abrasive:	
Sand Blast	8.00/SQ. FT.
Walnut Shell	8.50/SQ. FT.
Corn Chips	8.25/SQ. FT.

The cleaning techniques listed here should be used with caution. Consultation with an Historic Architect is recommended before any procedure is accepted.

WATERPROOFING BELOW GROUND LEVEL

Bituminous Asphalt Coating - Brushed on 2 coat	2.50/SQ. FT.
- Trowled on 1/2 inch thick	3.00/SQ. FT.

MOVING OF HISTORIC STRUCTURES

Wood Frame Building up to 24′ wide	15.00/SQ. FT.
Masonry Building	18.00/SQ. FT.
For Building 24′ - 48′ wide add	3.00/SQ. FT.
For each additional day add	2,000.00
Construct New Foundation and Hook-up (Including moving of building)	40.00/SQ. FT.

(This price is figured on lst floor square foot area)

EXTERIOR STAIRS: Wood

Repairs	2,000.00/Flight
Replace	3,000.00/Flight

EXTERIOR FINISHES		
Wood Siding - Repair	$	6.50/SQ. FT.
- Replace		6.00/SQ. FT.
Board and Batten - Repair		5.50/SQ. FT.
- Replace		5.00/SQ. FT.
Wood Shingles - Repair		4.00/SQ. FT.
- Replace		3.00/SQ. FT.
Stucco - Repair		8.00/SQ. FT.
- Replace		7.00/SQ. FT.
FOUNDATION WORK		
Stone Foundation - Repair		33.00/CU. FT.
- Replace		30.00/CU. FT.
Metal Post Supports		100.00/Each
Wood Post as Foundation Supports/Replace		33.00/LIN. FT.
Concrete Pads for Post (Foundation Supports) Approximately 2′ x 2′		60.00/Each
New Construction/Reinforced Concrete Wall		
Above Ground		800.00/CU. YD.
Below Ground		600.00/CU. YD.
Concrete Block Piers		15.00/SQ. FT.
Excavation for Foundation Repair - Machine		30.00/CU. YD.
- Hand		60.00/CU. YD.
Screw Jacks		200.00/Each
WINDOWS		
Unit (Custom Made) Including Glazing Approximately 5′ x 4′		1,000.00/Each
Window Trim Replacement		30.00/LIN. FT.

WINDOWS (Cont.)

Window Frame Replacement	$	30.00/LIN. FT.
New Glazing		20.00/SQ. FT.

EXTERIOR DOORS

Frames - Repair	200.00/Each
(Custom Built) - Replace	300.00/Each
Door - Repair	500.00/Each
(Custom Built - Replace	1,300.00/Each
Hardware - Repair - Clean	75.00/Each Set
- Replace	175.00/Each Set
Thresholds (Wood) - Replace	12.00/LIN. FT.
Door Trim	50.00/LIN. FT.

NDICAPPED ACCESS

EXTERIOR

Wheelchair Porch Lift	17,000.00/Flight
Ramps (Wooden)	25.00/SQ. FT.

INTERIOR

Stair Lift	20,000.00/Flight
Retrofitting Restrooms	1,800.00/Stall
Automatic Entrance Door Openers (Button Operated)	1,200.00/Each
Metal Kick Plates 6 inch x 36 inch - Aluminum	60.00/Each
- Bronze	90.00/Each
Elevator - 2 Floor	90,000.00

INTERIOR WORK

WOOD FLOORS

Refinishing - Power Sander	$	4.00/SQ. FT.
- Hand		5.00/SQ. FT.
- Oil/Varnish Finish		2.00/SQ. FT.
3 inch Oak Flooring - Splined - Repair		7.00/SQ. FT.
- Replace		6.00/SQ. FT.
T & G - Repair		6.00/SQ. FT.
- Replace		5.00/SQ. FT.
Maple - Splined - Repair		6.00/SQ. FT.
- Replace		5.00/SQ. FT.
T & G - Repair		5.00/SQ. FT.
- Replace		4.00/SQ. FT.

CEILING

Press Metal - Repair	12.00/SQ. FT.
- Replace	10.00/SQ. FT.
Alternate Material (Fiberglass)	9.00/SQ. FT.
Plaster - Repair	8.00/SQ. FT.
- Replace	7.00/SQ. FT.
Wood Molding (Crown) - Repair	14.00/LIN. FT.
- Replace	23.00/LIN. FT.
T & G Wood - Repair	9.00/SQ. FT.
- Replace	6.00/SQ. FT.
Masonite - Repair	3.00/SQ. FT.
- Replace	3.00/SQ. FT.
Sheet Rock - Repair	2.25/SQ. FT.
- Replace	2.00/SQ. FT.

INTERIOR STAIRS - Repair	$ 1,500.00/Flight
WALL COVERING	
Sheet Rock - Repair	2.00/SQ. FT.
- Replace	1.50/SQ. FT.
Plaster - Repair	6.00/SQ. FT.
- Replace	5.00/SQ. FT.
Wood - T & G - Repair	4.00/SQ. FT.
- Replace	3.50/SQ. FT.
PAINTING	
(2 Coat) - Walls	1.60/SQ. FT.
(Interior) - Ceilings	1.75/SQ. FT.
Door & Trim - 3′ x 7′	60.00/Each
- Windows	60.00/Each
- Trim	1.00/LIN. FT.
EXTERIOR	
Primer & 2 Coats - Brick	1.50/SQ. FT.
- Fence	1.00/SQ. FT.
- Wood Siding	1.40/SQ. FT.
- Trim	1.50/SQ. FT.
LOG CABIN REPAIR	
Epoxy Consolidation/Patching	
Rafter Ends	
6 inch Diam. or Less	140.00/LIN. FT
6 inch - 12 inch	160.00/LIN. FT.
Over 12 inch	190.00/LIN. FT.
Replacement of Rafter Log	
6 inch Diam. or Less	75.00/LIN. FT.
6 inch - 12 inch	85.00/LIN. FT.
Over 12 inch	100.00/LIN. FT.
Slicing of Log Ends	
6 inch Diam. or Less	75.00/LIN. FT.
6 inch - 12 inch	90.00/LIN. FT.
Over 12 inch	115.00/LIN. FT.

REHABILITATION

Mechanical Systems	18.00/SQ. FT. Floor Space
Electrical Service (Repair and Remodeling of Existing)	15.00/SQ. FT. Floor Space
Fire Sprinkler System	8.00/SQ. FT.
To Living Quarters	65.00/SQ. FT.
To Commercial	70.00/SQ. FT.
To Historic Period	120.00/SQ. FT.
(With Structural Problems Add)	30.00/SQ. FT.

HOUSING PROGRAM FUNDING SOURCES

Funding sources for park housing can be pursued in the following primary work elements (PWEs). A detailed listing of the PWEs and their definitions can be obtained from the park administrative officer or budget officer.

PWE*	Functional Title
190	Energy Conservation
220	Radon Testing and Mitigation
261	Buildings--Operation and Maintenance
262	Utility Systems--Operation and Maintenance
263	Sanitation Systems--Operation and Maintenance (Collection and Disposal)
264	Quarters Operation and Maintenance, Park Base
281	Grounds Maintenance
290	Cyclic Maintenance--Regular
291	Regional Repair and Rehabilitation Activities
294	Cyclic Maintenance, Quarters
300	Cultural Resources Operations and Maintenance
301	Cultural Resource Cyclic Maintenance
404	Net Construction
450	Income Receivable from Quarters Rental
451	Leasing of Historic Properties Reimbursable Income and Expenses
691	VIP Quarters Receipts
692	Quarters Income (House)
693	Quarters Income (Trailers)
694	VIP Quarters Expense
696	Quarters Operations and Maintenance (Houses and Dorms)
697	Quarters Utilities (Houses and Dorms)
698	Quarters Operation and Maintenance (Trailers)
699	Quarters Utilities (Trailers)

*This list is taken from "Primary Work Elements, FY 88" (see "References" section).

APPLICATION OF HOUSING FUNDING SOURCES

Line item construction	Major new construction/rehabilitation
Housing initiative	Major new construction/rehabilitation
Lump sum	Major new construction/rehabilitation
ONPS (park operating funds)	New construction/repair and rehabilitation
Cyclic maintenance	Repair and rehabilitation
Repair and rehabilitation	Repair and rehabilitation
Cultural resource cyclic maintenance	Repair and rehabilitation
Fee enhancement program (cultural resource protection)	Repair and rehabilitation
Housing income	Repair and rehabilitation, routine maintenance
Radon testing	Repair and rehabilitation
Energy conservation	Repair and rehabilitation

The Denver Service Center Branch of Specifications maintains a library of both MASTERSPEC outline specifications and NPS guide specifications arranged by the sixteen division format of the Construction Specifications Institute (CSI).

The MASTERSPEC format requires the designer to select from a range of general requirements, materials, and installation techniques to tailor a specification chapter for specific project requirements. The NPS guide specifications are relatively complete and usually require only minor modifications by the designer.

When the limited scope or scale of a construction contract requires a more concise specification format, the designer should still refer to either the MASTERSPEC or NPS specifications to determine the basic performance requirements and reference standards for each element of work.

The following pages contain indexes for the specification sections available under the MASTERSPEC and NPS formats. Also included is a listing of organizations that provide reference standards for various building materials.

A/S/C Basic Version

MASTERSP

THE AMERICAN INSTITUTE OF ARCHITECTS

Table of Contents

© 1987, AIA, all rights reserved 1735 New York Avenue, N.W., Washington, D.C. 20006

N OR U	DATE OF ISSUE	SECTION NUMBER	SECTION TITLE	SECTION DESCRIPTION
			DIVISION 1 - GENERAL REQUIREMENTS	
U	11/87	01010	SUMMARY OF THE WORK	Tech. definitions of scope terminology.
U	11/87	01020	ALLOWANCES	Allowance provisions.
N	11/87	01026	UNIT PRICES	Provisions for Unit Prices.
N	11/87	01027	APPLICATIONS FOR PAYMENT	Administrative requirements for Payment
U	11/87	01030	ALTERNATES	Provisions for alternates.
U	11/87	01040	PROJECT COORDINATION	Administrative rqmnts. for coordinatior
U	11/87	01045	CUTTING AND PATCHING	Special procedures.
N	11/87	01050	FIELD ENGINEERING	Procedures for laying-out the building.
U	11/87	01090	DEFINITIONS AND STANDARDS	MASTERSPEC terminology, acronyms, trade names & addresses.
N	11/87	01200	PROJECT MEETINGS	Administrative requirements for project meetings.
N	11/87	01300	SUBMITTALS	Procedures for submittals.
U	11/87	01400	QUALITY CONTROL SERVICES	Quality control; testing and inspectior
U	11/87	01500	TEMPORARY FACILITIES	Services, facilities, support security.
N	11/87	01600	MATERIAL AND EQUIPMENT	Quality control of products.
N	11/87	01631	PRODUCT SUBSTITUTIONS	Procedures for handling substitutions
U	11/87	01700	PROJECT CLOSEOUT	End of project procedures.
N	1187	01740	WARRANTIES AND BONDS	Administrative requirements for special product warranties.
			DIVISION 2 - SITEWORK	
	2/86	02070	SELECTIVE DEMOLITION	Partial demolition for alteration work.
	2/83	02110	SITE CLEARING	Clearing, grubbing, topsoil removal.
	2/87	02150	SHORING AND BRACING	Soldier piles, lagging.
	2/83	02200	EARTHWORK	Excavating, filling, grading.
	2/87	02280	TERMITE CONTROL	Soil treatment.
	2/87	02360	DRIVEN PILES	Timber, steel shell, pc., conc., steel.
	2/87	02380	CAISSONS	Drilled, with/without bells.
	2/83	02480*	LANDSCAPE WORK	Trees, shrub, lawns.
	2/86	02513	ASPHALT CONCRETE PAVING	General applications.
	2/85	02514	PORTLAND CEMENT CONCRETE PAVING	General applications.
	11/83	02515	UNIT PAVERS	General applications.
	3/85	02666	POTABLE WATER SYSTEMS	Main to meter.
	3/85	02668	FIRE WATER SYSTEMS	Exterior lines, hydrants.
	2/85	02670	WATER WELL	Drilling, casing, pipe (no pumps).
	5/87	02710	FOUNDATION DRAINAGE	Footings, underslab.
	5/85	02720	STORM SEWAGE SYSTEMS	Storm, sanitary.
	5/85	02730	SANITARY SEWAGE SYSTEMS	
	5/85	02740	SEPTIC SYSTEM	Tank, distr. box, drainage pipe.
	8/87	02770	POND AND RESERVOIR LINERS	Temporary, long-term storage.
	2/85	02810	UNDERGROUND IRRIGATION SYSTEM	Heads, pipe, controls.
	2/84	02830	CHAIN LINK FENCING AND GATES	Standard chain link systems.

END OF VOLUME 1

N NEW U - UPDATE
* 1983 CSI MASTERFORMAT NUMBER FOR SECTION 02480 IS 02900.

A/S/C Basic Version

MASTERSPEC

THE AMERICAN INSTITUTE OF ARCHITECTS

Table of Contents

© 1987, AIA, all rights reserved. 1735 New York Avenue, N.W., Washington, D.C. 20006

N OR U	DATE OF ISSUE	SECTION NUMBER	SECTION TITLE	SECTION DESCRIPTION
			DIVISION 3 - CONCRETE	
	5/87	03310	CONCRETE WORK	General applications.
	5/87	03320	CONCRETE FLOOR TOPPING	Applied over base slabs.
	5/86	03350	SPECIAL CONCRETE FINISHES	Mechanical finishes; bushhammer, etc.
	8/87	03410	STRUCTURAL PRECAST CONCRETE	Conventional precast units.
	5/86	03450	ARCHITECTURAL PRECAST CONCRETE	Exposed surface units.
	5/87	03470	TILT-UP CONCRETE CONSTRUCTION	Wall panels.
	5/86	03520	LIGHTWEIGHT INSULATING CONCRETE	Mineral aggregate types.
			DIVISION 4 - MASONRY	
	5/85	04200	UNIT MASONRY	General applications; walls, partitions.
	5/85	04230	REINFORCED UNIT MASONRY	Hollow and solid units.
	2/87	04270	GLASS UNIT MASONRY	Glass block.
	11/86	04400	STONEWORK	Exterior cut stonework.
	2/86	04500	MASONRY RESTORATION AND CLEANING	General applications.
			DIVISION 5 - METALS	
	8/86	05120	STRUCTURAL STEEL	Framing systems.
	8/86	05210	STEEL JOISTS AND JOIST GIRDERS	Standard SJI units.
	5/86	05300	METAL DECKING	Roof, floor, composite types.
	5/86	05400	COLD-FORMED METAL FRAMING	Formed studs, joists.
	2/84	05500	METAL FABRICATIONS	Iron and steel items (not sheet metal).
	5/87	05520	HANDRAILS AND RAILINGS	Aluminum and stainless steel pipe railing systems, ornamental metal and glass railing systems.
	2/84	05580	MISCELLANEOUS SHEET METAL	Ferrous/non-ferrous, custom; n/flashing.
	2/84	05700	ORNAMENTAL METALWORK	Stainless/non-ferrous items.
	2/83	05715	PREFABRICATED SPIRAL STAIRS	Standard units.
			DIVISION 6 - WOOD AND PLASTICS	
	8/86	06100	ROUGH CARPENTRY	Framing, sheathing, subflooring, etc.
	2/83	06130	HEAVY TIMBER CONSTRUCTION	Solid timber framing, decking.
	5/85	06170	STRUCTURAL GLUED LAMINATED UNITS	Built-up framing, decking.
	8/86	06192	PREFABRICATED WOOD TRUSSES	Metal plate connected members.
	2/83	06200	FINISH CARPENTRY	Interior/exterior exposed non-structural.
	11/84	06400	ARCHITECTURAL WOODWORK	Plant fabricated, "Architectural" qlty.

END OF BASIC VOLUME 2

N = NEW U = UPDATE

A/S/C Basic Version

MASTERSI

THE AMERICAN INSTITUTE OF ARCHITECTS

Table of Contents

© 1987, AIA, all rights reserved 1735 New York Avenue, N.W., Washington, D.C. 20006

N OR U	DATE OF ISSUE	SECTION NUMBER	SECTION TITLE	SECTION DESCRIPTION
			DIVISION 7 - THERMAL AND MOISTURE PROTECTION	
	5/85	07110	BITUMINOUS WATERPROOFING	Hot-applied waterproofing.
	8/87	07115	SHEET WATERPROOFING	Elastic, supported mastic, mtl. sandwi
	5/85	07120	FLUID-APPLIED WATERPROOFING	Urethane and rubberized asphalt types.
	5/85	07160	BITUMINOUS DAMPPROOFING	Hot and cold dampproofing.
	8/85	07175	WATER REPELLENTS	Clear silicone, acrylic types.
	11/85	07200	INSULATION	Common building types, excluding roof.
	5/87	07241	EXTERIOR INSULATION AND FINISH SYSTEMS-CLASS PB	Polymer-based protective finish coatin and inner layer of thermal insulatio
	5/87	07242	EXTERIOR INSULATION AND FINISH SYSTEMS-CLASS PM	Polymer-modified protective finish coating and inner layer of thermal insulation.
	11/85	07250	SPRAYED-ON FIREPROOFING	Miner fiber, aggregate, oxychloride, intumescent.
	11/85	07311	ASPHALT SHINGLES	Both organic and fiberglass based.
	11/85	07317	WOOD SHINGLES AND SHAKES	Shingles and shakes for roofing and siding.
	8/83	07410	PREFORMED ROOFING AND SIDING	Standard prefabricated metal units.
	8/83	07460	SIDING	Wood, simulated wood, residential type
	8/85	07510	BUILT-UP ASPHALT ROOFING SYSTEM	Hot asphalt systems, insulation.
	8/85	07512	BUILT-UP COAL TAR ROOFING SYSTEM	Hot coal tar systems; insulation.
	8/87	07530	FLEXIBLE SHEET ROOFING SYSTEM	Loose ballasted, spot-attached, adhere
	5/85	07570	TRAFFIC TOPPING	Fluid-applied.
	2/84	07600	FLASHING AND SHEET METAL	Mostly for roofing systems.
	2/84	07620	METAL FASCIAE AND COPINGS	Aluminum std. products.
	5/87	07700	ROOF SPECIALTIES AND ACCESSORIES	Skylight, vent, hatch, curb units.
	8/87	07900	JOINT SEALERS	Liquid sealants, gaskets, fillers.

END OF BASIC VOLUME 3

N = NEW U = UPDATE

A/S/C Basic Version

MASTERSPEC

THE AMERICAN INSTITUTE OF ARCHITECTS

Table of Contents

© 1987, AIA, all rights reserved. 1735 New York Avenue, N.W., Washington, D.C. 20006

N OR U	DATE OF ISSUE	SECTION NUMBER	SECTION TITLE	SECTION DESCRIPTION
		DIVISION 8 - DOORS AND WINDOWS		
	5/84	08110	STEEL DOORS AND FRAMES	Standard manufactured units.
	2/87	08211	FLUSH WOOD DOORS	Plant fabricated, may be pre-fit.
	2/87	08212	PANEL WOOD DOORS	Stile and rail doors, stock or custom.
	8/86	08305	ACCESS DOORS	Wall and ceiling types.
	5/86	08310	SLIDING METAL FIRE DOORS	Composite, hollow/sheet metal, tin-clad.
	11/83	08311	SLIDING GLASS DOORS	Wood and aluminum types.
	11/84	08330	OVERHEAD COILING DOORS	Steel, aluminum solid curtains.
	11/84	08340	OVERHEAD COILING GRILLES	Open mesh curtains.
	5/83	08350	FOLDING DOORS AND PARTITIONS	Wood and fabric types.
	11/84	08360	SECTIONAL OVERHEAD DOORS	Steel, aluminum, plastic panels.
	2/87	08385	SAFETY GLASS DOORS	Tempered glass without frames.
	2/87	08410	ALUMINUM ENTRANCES AND STOREFRONTS	Standard systems, hardware.
	2/87	08460	AUTOMATIC ENTRANCE DOORS	Packaged with frames and hardware.
	5/87	08470	REVOLVING DOORS	Standard entrance units.
	8/86	08510	STEEL WINDOWS	Common stock and custom types.
	8/86	08520	ALUMINUM WINDOWS	Most standard types.
	11/86	08525	ALUMINUM/ARCHITECTURAL WINDOWS	Monumental type aluminum windows.
	5/83	08610	WOOD WINDOWS	Most standard types.
	5/84	08710	FINISH HARDWARE	For doors; application included.
	8/86	08800	GLASS AND GLAZING	General applications.
	2/86	08900	GLAZED CURTAIN WALL	Stock aluminum systems.

END OF BASIC VOLUME 4

N = NEW U = UPDATE

A/S/C Basic Version

MASTERSP

THE AMERICAN INSTITUTE OF ARCHITECTS

Table of Contents

© 1987, AIA; all rights reserved. 1735 New York Avenue, N.W., Washington, D.C. 20006

N OR U	DATE OF ISSUE	SECTION NUMBER	SECTION TITLE	SECTION DESCRIPTION
			DIVISION 9 - FINISHES	
	2/85	09200	LATH AND PLASTER	All normal types; metal support systems
	8/83	09215	VENEER PLASTER	On gypsum board base.
	8/87	09250	GYPSUM DRYWALL	Includes metal support systems.
	8/83	09270	DRYWALL SHAFT SYSTEMS	Includes studs, etc.
	2/86	09300	TILE	Cer. mosaic, gl. wall, quarry, pvr. til
	8/86	09400	TERRAZZO	Cementitious, modified cemts., resinous
	5/86	09510	ACOUSTICAL CEILINGS	Composition, mtl.; tile, lay-in; suspns
	8/86	09521	ACOUSTICAL WALL PANELS	Spline- and back-mounted units.
	2/87	09550	WOOD FLOORING	Strip, parquet, impregnated.
	11/86	09600	INTERIOR STONEWORK	Trim, facings, flooring.
	11/83	09635	BRICK FLOORING	Interior applications only.
	8/84	09650	RESILIENT FLOORING	Tile and sheet, accessories.
	2/87	09680	CARPETING	Normal contract carpet and accessories
	5/86	09800	SPECIAL COATINGS	Other than normal painting systems.
	2/84	09900	PAINTING	Interior and exterior coatings.
	8/84	09950	WALLCOVERINGS	Vinyl, fabric, paper, wood veneer.

END OF BASIC VOLUME 5

N = NEW U = UPDATE

A/S/C Basic Version

MASTERSPEC

THE AMERICAN INSTITUTE OF ARCHITECTS

Table of Contents

© 1987, AIA, all rights reserved. 1735 New York Avenue, N.W., Washington, D.C. 20006

N OR U	DATE OF ISSUE	SECTION NUMBER	SECTION TITLE	SECTION DESCRIPTION
DIVISION 10 - SPECIALTIES				
	11/85	10100	CHALKBOARDS AND TACKBOARDS	Standard systems; general applications.
	5/87	10160	TOILET PARTITIONS	Standard metal and plastic laminate types.
	8/82	10200	LOUVERS AND VENTS	Fixed/adjustable; door, brick.
	5/86	10270	ACCESS FLOORING	Port. modular panels, support systems.
	5/87	10350	FLAGPOLES	Steel, st. steel, aluminum, bronze.
	11/85	10410	DIRECTORIES AND BULLETIN BOARDS	Changeable letters and name strip types.
	11/85	10440	SPECIALTY SIGNS	Metal, plastic.
	8/85	10500	METAL LOCKERS	Wardrobe and athletic types.
	5/85	10522	FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES	Includes portable units, cabinets, etc.
	8/85	10550	POSTAL SPECIALTIES	Boxes and chutes.
	8/85	10605	WIRE MESH PARTITIONS	Freestanding and overhead-braced.
	2/87	10650	OPERABLE PARTITIONS	Conventional large size units.
	2/86	10750	TELEPHONE ENCLOSURES	Standard and customized units.
	11/85	10800	TOILET AND BATH ACCESSORIES	"Stock" manufactured units.
	11/85	10830	MIRROR UNITS	Metal framed, glass, polished metal and acrylic.
DIVISION 11 - EQUIPMENT				
	11/82	11050	LIBRARY EQUIPMENT	Bookshelves, bookstacks, depositories.
	11/82	11060	PORTABLE THEATER AND STAGE EQUIPMENT	Portable stages, risers, acoustic shells.
	11/82	11062	STAGE CURTAINS	Includes fabrics and tracks.
	2/86	11132	PROJECTION SCREENS	Electric, manual, standard units.
	2/86	11150	PARKING CONTROL EQUIPMENT	Basic components.
	2/86	11160	LOADING DOCK EQUIPMENT	Dock bumpers, levelers, and seals.
	8/85	11400	FOOD SERVICE EQUIPMENT	Commercial, nonspecialized.
	11/82	11450	RESIDENTIAL EQUIPMENT	Kitchen, laundry appliances.
	11/85	11460	UNIT KITCHENS	Standard metal types.

END OF BASIC VOLUME 6

N = NEW U = UPDATE

A/S/C Basic Version

MASTERSP

THE AMERICAN INSTITUTE OF ARCHITECTS

Table of Contents

© 1987, AIA; all rights reserved. 1735 New York Avenue, N.W., Washington, D.C. 20006

N OR U	DATE OF ISSUE	SECTION NUMBER	SECTION TITLE	SECTION DESCRIPTION
			DIVISION 12 - FURNISHINGS	
	5/83	12390	KITCHEN CABINETS	Prefab. modular units w/countertops.
	11/85	12500	WINDOW TREATMENT	Horiz./vert. blinds, drapery track.
	8/84	12650	ACCESSORIES	Examples of typical stock units.
	2/83	12670*	ENTRANCE MATS	Vinyl, rubber, cocoa mats; metal frame
	2/83	12710	AUDITORIUM AND THEATER SEATING	Upholstered, plain; lift-seat.
	5/84	12760	TELESCOPING BLEACHERS	Standard systems; manual, motorized.
			DIVISION 13 - SPECIAL CONSTRUCTION	
	11/85	13052	SAUNAS	Precut/prefab.; heaters, accessories.
	8/83	13070**	INTEGRATED CEILINGS	Grid-based, linear metal types.
	11/86	13120	PRE-ENGINEERED BUILDINGS	Manufactured steel framed structures.
			DIVISION 14 - CONVEYING SYSTEMS	
	2/87	14100	DUMBWAITERS	Pre-engineered, power driven.
	2/85	14210	ELECTRIC ELEVATORS	Pre-engineered, traction.
	2/85	14240	HYDRAULIC ELEVATORS	Pre-engineered, units.
	2/85	14310	ESCALATORS	Normal single-story units.
	2/87	14560	CHUTES	Vertical free-fall types.

END OF BASIC VOLUME 7

N = NEW U = UPDATE
* 1983 MASTERFORMAT NO. FOR SECTION 12670 IS 12690
** 1983 MASTERFORMAT NO. FOR SECTION 13070 IS 13025

ASC/B/TOC

NAME: _____ PHONE: _____

PARK (4-DIGIT ALPHA CODE)-PKG. #_____ ACCOUNT NO.: _____
(7-DIGIT NUMERICAL #)

Attached is a list of master specification sections showing section numbers, titles, and document dates (the date appearing in the lower left corner of the master section). The list may be used for ordering master sections and for determining dates of current versions. It has two parts:

1. Outdated documents, recently replaced by new versions, identified in the first column by "X", the section number, and the document date. These documents should not be ordered, but if part of a current bid package they may be useable before they are deleted from current computer storage. Deletion date is shown in the second column. Check with the Branch of Specifications on any "X" documents nearing time for deletion.

2. Current masters, identified in the first column by the section number, and interim versions, identified in the first column by the section number - I (e.g., 03310-I). The date in the second column preceding the title is the document date. Interim versions may be ordered and used until a final version of the section is available. They should be carefully reviewed, and constructive criticism is welcome.

Before submitting a bid package, designers should compare the document dates on the master sections with dates on the list to make certain all sections used are current or in computer storage. Revised lists are available the first week of each month, and a current, complete set of master sections may be reviewed in the Branch of Specifications at any time.

ORDERING INFORMATION

Items checked for ordering will generally be available by 10:00 a.m. following the day the order is received.

Most Division 1 documents are ordered in a package for specific types of procurement. These documents are also included in the listing of master specifications for the purpose of determining whether a document is current.

DSC PROCUREMENT: _____ DESIGN ONLY PRIP: _____

____ DIVISION 1 PACKAGE: COMPETITIVE BID CONSTRUCTION (FAC)

____ DIVISION 1 PACKAGE: SBA 8(a) CONSTRUCTION (SBA)

____ DIVISION 1 PACKAGE: COST-PLUS-FIXED-FEE NEGOTIATED CONSTRUCTION (NEG)

____ DIVISION I PACKAGE: COMPETITIVE BID SUPPLY (SUP)

NOTE: For examples of editing master specifications, see Guide to Specifiers. If you need one, please check the following blank.

____ GUIDE TO SPECIFIERS

MAY 198[illegible]

X00000 - OUTDATED DOCUMENTS (REPLACED BY NEW VERSIONS)

X01010-11/86	TO BE DELETED 09/01/88
X02229-10/85	TO BE DELETED 11/01/88
X02665-10/85	TO BE DELETED 10/01/88
X02921-05/87	TO BE DELETED 10/01/88
X02937-10/85	TO BE DELETED 09/01/88
X02950-05/87	TO BE DELETED 09/01/88
X04201-10/85	TO BE DELETED 09/01/88
X06192-10/85	TO BE DELETED 10/01/88
X08810-10/85	TO BE DELETED 10/01/88
X16721-04/87	TO BE DELETED 10/01/88

01000 - DIVISION 1 - GENERAL REQUIREMENTS

01010	02/88-SUMMARY OF WORK
01025	11/86-DEFINITION OF BID ITEMS
01050	10/85-FIELD ENGINEERING
01090	02/88-REFERENCE STANDARDS
01170	04/87-ACCIDENT PREVENTION
01200	11/86-PROJECT MEETINGS
01300	05/87-SUBMITTALS
01510	12/86-TEMPORARY SERVICES
01530	11/86-BARRIERS
01560	08/87-TEMPORARY CONTROLS
01590	12/86-FIELD OFFICES AND SHEDS
01600	10/85-MATERIAL AND EQUIPMENT
01670	10/85-SYSTEM DEMONSTRATION AND TRAINING
01700	11/86-PROJECT CLOSEOUT
01730	10/85-OPERATION AND MAINTENANCE DATA

02000 - DIVISION 2 - SITE WORK

02060	10/85-BUILDING DEMOLITION
02071	10/85-REMOVAL OF PAVEMENTS AND STRUCTURES
02072	10/85-MINOR DEMOLITION FOR HISTORIC FABRIC
02080	10/85-ASBESTOS REMOVAL
02110	10/85-CLEARING AND GRUBBING
02114	06/87-EXPLOSIVES
02114.1	12/86-EXPLOSIVES (PARK & REGION)
02116	10/85-SELECTIVE THINNING - VISTA CLEARING
02207	10/85-ROADWAY RECONDITIONING
02208	10/85-OVERHAUL
02210	10/85-SITE EXCAVATION AND GRADING
02221	10/85-UTILITY TRENCHING AND BACKFILLING
02223	10/85-ROADWAY EXCAVATION AND EMBANKMENT
02225	10/85-STRUCTURE EXCAVATION AND BACKFILL
02229	04/88-UTILITY LINE MARKING
02231	10/85-PORTLAND CEMENT-TREATED BASE COURSE
02232	10/85-AGGREGATE BASE COURSE
02233	10/85-WATERING
02244	10/85-BEACH STABILIZATION - SAND FENCING
02271	10/85-RIPRAP
02281	10/85-TERMITE CONTROL
02511	10/85-BITUMINOUS SURFACE TREATED WALKS
02512	10/85-STONE PAVING
02513	10/85-BITUMINOUS WALKS
02515	10/85-WALKS, CURBS, AND GUTTERS
02516	10/85-CRUSHED STONE WALKS
02517	10/85-BRICK PAVING
02525	10/85-STONE CURB

02520 10/85-PRECAST CONCRETE CURB
02527 10/85-BITUMINOUS CONCRETE CURB
02529 10/85-PAVEMENT MARKINGS
02551 10/85-BITUMINOUS PRIME COAT AND TACK COAT
02552 10/85-BITUMINOUS SEAL COAT AND COVER AGGREGATE
02553 02/86-BITUMINOUS CONCRETE PAVEMENT
02554 10/85-DOUBLE BITUMINOUS SURFACE TREATMENT
02581 10/85-TRAFFIC MARKINGS
02601 10/85-TESTING OF WATER AND SEWER LINES
02609 10/85-MANHOLES
02610 10/85-SEWER CLEANOUTS
02609 10/85-MAIN LINE ALTERATIONS AND REPAIRS
02641 10/85-GATE VALVE WITH SERVICE BOX
02643 10/85-CURB STOP WITH CAST IRON SERVICE BOX
02644 10/85-FIRE HYDRANTS
02645 10/85-AIR- RELEASE VALVE AND CONCRETE VALVE BOX
02646 02/86-VALVE AND CONCRETE VALVE BOX
02647 10/85-REDUCER VALVE AND CONCRETE VALVE BOX
02665 03/88-WATER PIPING AND APPURTENANCES
02666 10/85-BACKFLOW DUCE
02675 10/85-DISINFECTION OF WATER LINES
02711 10/85-UNDERDRAINS
02712 10/85-PERFORATED CLAY PIPE
02721 10/85-CONCRETE DROP INLETS AND CATCH BASINS
02722 03/88-CULVERTS AND STORM DRAINS
02723 10/85-STRUCTURAL PLATE PIPE
02724 10/85-CONCRETE HEADWALLS
02725 10/85-BRICK HEADWALLS
02726 10/85-STONE HEADWALLS
02731 10/85-GRAVITY SEWER PIPING AND APPURTENANCES
02732 10/85-PRESSURE SEWER PIPING AND APPURTENANCES
02745 10/85-CONCRETE SEPTIC TANK
02746 10/85-TRAILER SANITARY DISPOSAL STATION
02771 10/85-CONCRETE RESERVOIR
02772 10/85-STEEL RESERVOIR
02831 10/85-CHAIN LINK FENCE
02832 10/85-RAILED SERVANT WIRE FENCE
02833 10/85-SPLIT RAIL FENCE
02834 10/85-WOOD GATES
02841 10/85-WOOD GUARDRAIL
02842 10/85-METAL GUARDRAIL
02843 10/85-BARRIER POST
02844 10/85-GUIDE AND BARRIER POSTS
02845 10/85-TIMBER CURB
02846 10/85-CONCRETE WHEEL STOPS
02847 10/85-SIGNPOSTS
02848 10/85-CATTLE GUARD
02849 10/85-EXTERIOR SIGNS
02871 10/85-DRINKING FOUNTAIN
02872 10/85-REFUSE CONTAINER UNIT
02873 10/85-OUTDOOR FIREPLACES
02874 10/85-TRASH RECEPTACLE
02875 10/85-PICNIC TABLE
02876 10/85-WOOD BENCHES
02911 03/88-TOPSOIL
02912 10/85-STABILIZED TURF

02931 10/85-SEEDING, FERTILIZING, AND MULCHING
02932 10/85-SODDING
02933 10/85-PLUGGING
02934 10/85-SPRIGGING
02935 10/85-SPRIGGING - BEACH GRASS
02936 10/85-HYDROSEEDING
02937 02/88-MISCELLANEOUS SEEDING
02950 02/88-PLANTING
02951 10/85-STEEL EDGING
02970 10/85-LANDSCAPE MAINTENANCE
03000 - DIVISION 3 - CONCRETE
03301 10/85-CONCRETE WORK
03305 10/85-PORTLAND CEMENT CONCRETE
03306 10/85-CONCRETE
03310-I 01/86-STRUCTURAL CONCRETE-INTERIM REVISION
03355 10/85-TABBY
04000 - DIVISION 4 - MASONRY
04100 10/85-MORTAR
04201 02/88-MASONRY WORK
04211 10/85-BRICK WALLS
04222 10/85-CONCRETE UNIT MASONRY WALLS
04290 10/85-ADOBE MASONRY
04402 10/85-STONE WALLS
04520 10/85-MASONRY RESTORATION
05000 - DIVISION 5 - METALS
05120 10/85-STRUCTURAL STEEL
05213 10/85-OPEN WEB STEEL JOISTS
05311 10/85-STEEL ROOF DECK
05430 10/85-TUBULAR STEEL
05522 10/85-STEEL BRIDGE RAILING
05701 10/85-WROUGHT IRON - 18TH CENTURY
06000 - DIVISION 6 - WOOD AND PLASTICS
06100 01/87-ROUGH CARPENTRY
06192 03/88-PREFABRICATED WOOD TRUSSES
06200 03/87-FINISH CARPENTRY
06300 10/86-WOOD TREATMENT
07000 - DIVISION 7 - THERMAL AND MOISTURE PROTECTION
07110 10/85-MEMBRANE WATERPROOFING
07160 10/85-BITUMINOUS DAMPPROOFING
07190 10/85-VAPOR BARRIER
07210 10/85-BUILDING INSULATION
07220 10/85-ROOF AND DECK INSULATION
07311 10/85-ASPHALT SHINGLES
07312 10/85-CEDAR SHAKE ROOF
07313 10/85-WOOD SHINGLE ROOF
07314 10/85-OVER-ROOFING SHINGLES WITH SHAKES
07510 10/85-BUILT-UP ROOFING
07600 10/85-FLASHING AND SHEET METAL
07611 10/85-LEAD ROOFING AND FLASHING
07631 10/85-GUTTERS AND DOWNSPOUTS
07900 10/85-SEALANTS
08000 - DIVISION 8 - DOORS AND WINDOWS
08110 10/85-STEEL DOORS AND FRAMES
08120 10/85-ALUMINUM DOORS AND FRAMES
08210 10/86-FLUSH WOOD DOORS
08311 10/85-ALUMINUM SLIDING GLASS DOORS

08520 10/85-ALUMINUM WINDOWS
08610 10/85-WOOD WINDOWS
08710 10/85-FINISH HARDWARE
08810 03/88-GLAZING
08840 10/85-GLAZING PLASTICS
09000 - DIVISION 9 - FINISHES
09100 01/87-METAL STUD FRAMING SYSTEM
09210 10/85-LATH AND PLASTER
09251 10/85-GYPSUM DRYWALL CONSTRUCTION
09310 10/85-CERAMIC AND QUARRY TILE
09510 10/85-ACOUSTICAL CEILINGS
09560 10/85-WOOD STRIP FLOORING
09650 10/85-RESILIENT FLOORING
09680 10/85-CARPETING
09860 10/85-TILE-LIKE COATING
09870 10/85-PAINTING - STEEL WATER TANK
09900 10/85-PAINTING
10000 - DIVISION 10 - SPECIALTIES
10160 02/86-TOILET PARTITIONS AND URINAL SCREENS
10351 10/85-ALUMINUM FLAGPOLE
10440 10/85-INTERIOR SIGNS
10800 10/85-TOILET AND BATH ACCESSORIES
11000 - DIVISION 11 - EQUIPMENT
12000 - DIVISION 12 - FURNISHINGS
13000 - DIVISION 13 - SPECIAL CONSTRUCTION
14000 - DIVISION 14 - CONVEYING SYSTEMS
15000 - DIVISION 15 - MECHANICAL
15010 10/85-GENERAL MECHANICAL PROVISIONS
15050 10/85-BASIC MATERIALS AND METHODS
15100 10/85-VALVES AND COCKS
15160 10/85-PUMPS
15240 10/85-VIBRATION ISOLATION AND SOUND CONTROL
15260 10/85-EQUIPMENT INSULATION
15290 10/85-DUCT INSULATION
15365 10/85-HALOGENATED FIRE EXTINGUISHING SYSTEM
15400 10/85-PLUMBING SYSTEMS
15481 10/85-NATURAL GAS PIPING
15482 10/85-OIL STORAGE TANKS, CONTROLS, AND PIPING
15510 10/85-HOT AND CHILLED WATER PIPING
15515 10/85-AIR SEPARATOR AND EXPANSION TANKS
15530 10/85-CHILLED WATER SYSTEM
15531 10/85-REFRIGERANT PIPING SYSTEM
15575 10/85-OIL-FIRED BOILER
15670 10/85-SPLIT SYSTEM AIR-CONDITIONER
15855 10/85-AIR HANDLING UNITS
15857 10/85-FAN COIL UNITS
15860 10/85-EXHAUST FANS
15880 10/85-ELECTRIC DUCT HEATERS
15890 11/86-DUCTWORK
15910 10/85-DUCT ACCESSORIES
15911 10/85-REGISTERS, GRILLES, AND DOUSERS
15955 10/85-CONTROLS AND INSTRUMENTATION
15956 10/85-HUMIDITY CONTROL
15992 10/85-TESTING BUILDING PIPING SYSTEMS
15995 10/85-TEST, ADJUST, AND BALANCE H&V SYSTEMS
16000 - DIVISION 16 - ELECTRICAL

_____	16010	04/87-GENERAL ELECTRICAL PROVISIONS
_____	16050	04/87-BASIC MATERIALS AND METHODS
_____	16060	10/85-AC MOTORS
_____	16191	10/85-ELECTRICAL MANHOLES AND PULLBOXES
_____	16200	08/86-POWER GENERATION
_____	16260	10/85-AUTOMATIC TRANSFER SWITCH
_____	16370	10/85-AERIAL PRIMARY POWER DISTRIBUTION
_____	16375	01/86-UNDERGROUND PRIMARY DISTRIBUTION
_____	16419	10/86-UNDERGROUND SECONDARY
_____	16420	04/87-ELECTRIC SERVICE
_____	16425	01/86-SWITCHBOARDS
_____	16450	10/85-GROUNDING
_____	16480	01/86-MOTOR CONTROLS
_____	16510	01/86-LIGHTING
_____	16670	10/85-LIGHTNING PROTECTION
_____	16721	03/88-FIRE DETECTION AND ALARM SYSTEM
_____	16727	10/85-INTRUSION ALARM SYSTEM
_____	16740	10/85-TELEPHONE FACILITIES

ORGANIZATIONS WITH REFERENCE STANDARDS

AA - Aluminum Association
AABC - Associated Air Balance Council
AAMA - Architectural Aluminum Manufacturers Association
AAN - American Association of Nurserymen
AASHTO - American Association of State Highway and Transportation Officials
ACI - Associated Concrete Institute
AGA - American Gas Association
AGC - Associated General Contractors
AIEEE - American Institute of Electrical and Electronics Engineers
AISC - American Institute of Steel Construction, Inc.
AISI - American Iron and Steel institute
AITC - American Institute of Timber Construction
AMCA - Air Moving and Conditioning Association
ANSI - American National Standards Association
APA - American Plywood Association
APHA - American Public Health Association
API - American Petroleum Association
AREA - American Railway Engineering Association
ARI - Air Conditioning and Refrigeration Institute
ARMA - Asphalt Roofing Manufacturers Association
ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME - American Society of Mechanical Engineers
ASTM - American Society for Testing and Materials
AWI - Architectural Woodwork Institute
AWPA - American Wood Preservers Association
AWPB - American Wood Preservers Bureau
AWPI - American Wood Preservers Institute
AWS - American Welding Society
AWWA - American Water Works Association
BBC - Basic Building Code.
BHMA - Builders Hardware Manufacturer's Association
BIA - Brick Institute of America
BOCA - Building Officials and Code Administrators International
CBM - Certified Ballast Manufacturers
CDA - Copper Development Association
CGA - Compressed Gas Association
CISPI - Cast Iron Soil Pipe Institute
CRA - California Redwood Association
CRSI - Concrete Reinforcing Steel Institute
CS - Commercial Standards
DEMA - Diesel Engine Manufacturer's Association

DOT - Department of Transportation
EEI - Electrical Edison Institute
ETL - Electrical Testing Laboratories
FGMA - Flat Glass Marketing Association
FHA - Federal Housing Administration
FHWA - Federal Highway Administration
FM - Factory Mutual Laboratory
FPL - U.S. Forest Products Laboratory
FS - Federal Specifications
GA - Gypsum Association
GOAA - General Outdoor Advertising Association
HPMA - Hardwood Plywood Manufacturers Association
ICBO - International Conference of Building Officials
ICEA - Insulated Cable Engineers Association
IEEE - The Institute of Electrical and Electronics Engineers
IFI - Industrial Fastners Institute
IMIAWC - International Masonry Industry All-Weather Council
IRS - Internal Revenue Service
LIA - Lead Industries Association, Inc.
MBMA - Metal Building Manufacturers Association
MCAA - Mechanical Contractors Association of America, Inc.
MEMA - Maple Flooring Manufacturer's Association
MIA - Marble Institute of America
MIMA - Mineral Insulation Manufacturer's Association
MLSFA - Metal Lath/Steel Framing Association
MS - Military Specifications
MSHA - Mine Safety and Health Administration
NAAMM - National Association of Architectural Metal Manufacturers
NACE - National Association of Corrosion Engineers
NBC - National Building Code
NBFU - National Bureau of Fire underwriters
NBS - National Bureau of Standards
NCMA - National Concrete Masonry Association
NCPI - National Clay Pipe Institute
NCSA - National Crushed Stone Association
NEC - National Electrical Code
NELMA - Northeastern Lumber Manufacturers Association
NEMA - National Electrical Manufacturers Association
NECS - National Electrical Safety Code
NEPA - National Fire Protection Association
NEPA - National Forest Products Association
NHLA - National Hardwood Lumber Association
NHPMA - Northern Hardwood and Pine Manufacturers Association
NIOSH - National Institute of Occupational Safety and Health
NLA - National Lime Association
NLMA - National Lumber Manufacturers Association
NMWIA - National Mineral Wool Insulation Association, Inc.
NOFMA - National Oak Floor Manufacturing Association
NPA - National Particleboard Association
NPCA - National Paint and Coating Association
NRCA - National Roofing Contractors Association
NSF - National Sanitation Foundation
NTMA - National Terrazo and Mosaic Association
NWMA - National Woodwork Manufacturers Association
OSHA - Occupational Safety and Health Administration

PCA - Portland Cement Association
PCI - Prestressed Concrete Institute
PI - Perlite Institute
PPI - Plastics Pipe Institute
PS - Product Standard
RCSHSB - Red Cedar Shingle and Handsplit Shake Bureau
RIS - Redwood Inspection Service
SAE - Society of Automotive Engineers
SBCC - Southern Building Code Congress International, Inc.
SCMA - Southern Cypress Manufacturers Association
SDI - Steel Deck Institute
SDI - Steel Door Institute
SEPA - Southern Forest Products Association
SHLMA - Southern Hardwood Lumber Manufacturers Association
SIGMA - Sealed Insulation Glass Manufacturers' Association
SJI - Steel Joist Institute
SMA - Screen Manufacturers' Association
SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Inc.
SPA - Southern Pine Association
SPI - Society of the Plastics Industry, Inc.
SPIB - Southern Pine Inspection Bureau
SSPC - Steel Structures Painting Council
SWI - Steel Window Institute
TCA - Tile Council of America
TPI - Truss Plate Institute
UBC - Uniform Building Code
UL - Underwriters Laboratories Inc.
WCLIB - West Coast Lumber Inspection Bureau
WPCF - Water Pollution Control Federation
WWPA - Western Wood Products Association

REHABILITATION GENERAL STATEMENT

The purpose of the rehabilitation portion of this guideline is to provide a systematic method of evaluating functional and physical deficiencies in each housing unit by mandating an on-site inspection of each unit using a prescribed procedure. That procedure will be used by all regions, thereby setting a measure of uniformity servicewide in the information gathering and priority setting process.

These procedures, to the greatest extent possible, must ensure that those living in NPS housing have safe, healthful, physically sound housing. This housing should also meet the needs of today's lifestyles, family units, and employee status (seasonal, temporary, and permanent).

The NPS Housing Unit Design Assistance Teams (HUDATs) established by each region and assisted by park personnel will be the key to the application and administration of this process. The inspections and evaluations will be accomplished by consultation, training, and site inspections.

The accomplishment of detailed condition surveys, by way of the rehabilitation inspection checklist, a priority setting system, and a preliminary (class C) estimate of costs, will assist managers in the overall housing management process.

Dollar guidelines have been established for housing initiative projects to ensure that the level of effort proposed for an individual housing unit is economically justifiable. Those guidelines are $20,000-$40,000 for single-family housing and $10,000-$20,000 for multiple-family housing and dorm units.

The preceeding dollar guidelines are just that. The intent is to ensure that the dollar levels now being expended from existing regional and park fund sources continue at the present percent of expenditure and that the upgrading of housing does not become totally dependent on special initiatives and the dollars associated with them. Significant funds are now being expended from existing fund sources such as cyclic, repair/rehabilitation, cultural cyclic, park operating funds, and housing income. Hopefully any special initiative funding would go toward reducing the tremendous backlog in housing improvement projects.

The high dollar guideline ($20,000 for multiple-family units and dorms and $40,000 for single-family units) would trigger a second level review to ensure that dollars expended equal appropriate payback in extending life and protection of historic resources. The life-cycle cost process on other higher level processes could be used to determine this.

Dollar limits alone should not be the sole criteria for determining if a rehab should take place or not. Management needs (by way of the housing management plans), aesthetic needs, and historic preservation needs must be folded into the total decision.

The inspection feature items are identified where available by the Maintenance Management System code numbers. When other inspection or inventory systems are functional, the Housing Oversight Committee will evaluate transition to those systems.

In surveying a housing unit for rehabilitation, the HUDAT will continually apply the following chapters to the extent applicable for that particular rehabilitation.

Regulations

Special Directive
NPS-36
Building Codes
Historic Preservation
Accessibility
Energy Conservation

Design

Park Design Themes
Site Design
Employee Design Preference
Climatic Design
Building Materials
Cost Analysis

Please also refer to figure 2 in the introduction of this guideline.

Numerous rehabilitation books and publications are available from both the government and the private sector. A partial list of these is available in the reference section of this guideline.

Routine maintenance is not a part of this design and rehabilitation manual because the Maintenance Management System (MMS) adequately addresses this aspect of housing.

The HUDAT should be familiar with the MMS to the point that they can assist parks in or ensure that the planning guidelines and service level planning components for tasks/activities related to housing rehab and maintenance are in place. Because housing has already been established as a management unit servicewide, parks can and are producing reports relative to actual work being performed on individual housing units. The HUDAT should acquire these reports in the park and use them in the decision processes.

INSTRUCTIONS ON HOW TO FILL OUT A HOUSING INSPECTION CHECKLIST

INTRODUCTION

This checklist addresses the procedures and requirements for building inspections by the Housing Unit Design Assistance Team (HUDAT). The condition assessments involve the collection of information and the production of a planning level report on the condition of each housing structure inspected.

The report, compiled by the Park Service and based on material provided by the inspection team, provides the following information:

Inventory Data--Information on architectural and engineering items, describing the major building features, determining the condition of the features, and identifying the priority of any work needs that are identified.

Condition Assessment Data--Information on deficiencies identified through the assessment process and describing and proposing corrective action with estimates included for material and labor costs.

Management Cost Summary--A one-page matrix of estimated costs for all recommended work. The matrix gives a clear picture of the approximate costs to correct the identified deficiencies.

Graphic Data--A sketch and simple drawings of existing floor plans indicating room use, bearing walls, and conditions. Color photocopies of exterior and representative interior photographs of the building are also provided.

FIELD PROCEDURES--BUILDING INVENTORY CHECKLIST

A set of field input forms should be used by the inspection team as a guide for taking field notes during the site inspection. The form is designed for use in both the inspection process and data entry. The first part of the form consists of administrative information and becomes the part of the report referred to as the general information section. Completed portions of the general information section will be provided beforehand by the park. The second part of the field input form, the building inventory, consists of 280 features grouped into the maintenance management divisions for buildings. A clean copy of the field input forms should be completed in the office.

BUILDING INVENTORY DATA

The building inventory section of the report contains the following information on each feature:

DESCRIPTION - A description of the physical characteristics of the feature defined in the inventory element checklist.

QUANTITY - Approximate dimension and units of each feature present in the building.

CONDITION - An assessment of the condition of each feature as 3 (poor), 2 (fair), or 1 (good) (as defined under the next heading "Condition").

PRIORITY - Placing required work in priority order using a rating of critical, serious, or minor (as defined under the heading "Deficiency Identification").

During field work, the inspector is required to walk through and around the building, field input form in hand, describing in detail all pertinent building features. The standardized Inventory Feature Checklist "Program Feature Condition Guidelines" in the Maintenance Management System should serve as a guide to what to look for in each feature that pertains to the building.

It is strongly recommended that the features be inspected in the order in which they are listed on the field input form. This is especially true if pocket tape recorders are used. After tape transcription, report preparation time can be significantly reduced when the information is already organized as it will appear in a building report. Regardless of how field notes are taken, either written directly onto a field input form or spoken into a pocket tape recorder, following the order of the field input form will ensure that no features are overlooked in the field inspection. Some of the features will not apply; in such cases indicate NA on the field input forms.

Deficiencies should be described as they appear in each feature, noting the extent or quantity of any damage, its location in or on the building, and any other information that will aid in the evaluation of the problem and the completion of the work recommendation.

Items that pertain to the features of fire and life safety or handicapped accessibility, such as door widths, should be field measured. This will ensure an accurate evaluation of the building's compliance with applicable building codes.

CONDITION

An evaluation of the CONDITION of each feature as 1 (good), 2 (fair), or 3 (poor) should be indicated on the field input form. It is also used as part of the criteria in establishing the significance of a feature.

A feature is evaluated as 1 (good) when

- the feature is intact, structurally sound, and performing its intended purpose
- there are few or no cosmetic imperfections
- the feature needs no repair and only minor or routine maintenance

A feature is evaluated as 2 (fair) when

- there are early signs of wear, failure, or deterioration, although the feature is generally structurally sound and performing its intended purpose
- there is failure of a subcomponent of the feature
- replacement of up to 25 percent of the feature or replacement of a defective subcomponent is required

A feature is evaluated as 3 (poor) when

- the feature is no longer performing its intended purpose
- the feature is missing
- deterioration or damage affects more than 25 percent of the feature and cannot be adjusted or repaired
- the feature shows signs of imminent failure or breakdown
- the feature requires major repair or replacement

DEFICIENCY IDENTIFICATION

During the field inspection, each deficiency should be noted by priority as critical, serious, or minor.

Critical Deficiencies

A critical deficiency of a feature exists where

there is advanced deterioration that has resulted in the failure of the building feature or will result in the failure of the building feature if not corrected within two years, and/or

there is accelerated deterioration of adjacent or related building materials as a result of the feature's deficiency, and/or

there is a threat to the health and/or safety of the user

Critical deficiencies can include, but are not limited to, undersized floor joists that are inadequate for the load of the building, leaking roof, failed drainage system, or a furnace located in an unprotected crawl space.

Serious Deficiencies

A serious deficiency of a feature exists where

there is deterioration which, if not corrected within 2-5 years, will result in the failure of the building feature, and/or

a threat to the health and/or safety of the user may occur within 2-5 years if the deterioration is not corrected, and/or

there is deterioration of adjacent or related building materials and/or systems as a result of the feature's deficiency, and/or

there is a failure to meet a legislative requirement

Serious deficiencies can include, but are not limited to an old electrical system that is inadequate for present use, inadequate ventilation of the crawl space, or a public building that is not accessible to the handicapped.

Minor Deficiencies

A minor deficiency of a feature exists where

standard preventive maintenance practices and building conservation methods have not been followed, and/or

there is a reduced life expectancy of affected or related building materials and/or systems, and/or

there is a condition with long-term impact beyond 5 years

Minor deficiencies can include, but are not limited to, cracked window glass and cracked plaster on interior wall surface.

PLAN VALIDATION AND MEASUREMENT

The assessment report will include, at the minimum, single-line floor plans of every floor; these are to be provided by the inspection team. These plans are for the purpose of functional analysis and to ensure that an accurate record of the building plan is available from the date of inspection. If there are repetitive floors, as might be encountered in a dormitory building, a typical floor plan only is required for similar floors, with separate plans required for nontypical floors. The typical floor plan should be labeled to identify those floors it represents. These are to be simple drawings, with only enough detail to convey a clear understanding of spatial relationships and the location of major architectural features. Absolute accuracy of room sizes and dimensions is not required.

The following standards and conventions shall be used on all drawings:

1. A north arrow to indicate building orientation
2. A designation of space use for all areas where use can be determined
3. Rooflines and overhangs shall be shown with dashed lines
4. Door swings shall be graphically presented
5. Key drawing with bearing walls (B) indicated
6. Indication of overall dimensions

Plans may be prepared from construction drawings or reports available from the park, but such drawings must be verified on site by the inspection team to ensure accuracy. Many buildings have undergone modifications since the preparation of the drawings, and existing documentation may be obsolete or inaccurate. Where no drawings exist, the building must be field measured in enough detail to prepare drawings.

PHOTOGRAPHIC DOCUMENTATION

Photographic documentation of each building inspected must be provided in the form of 35mm color photographs.

The following photographs are required by the program

front and rear elevations, when possible

a minimum of two details of major deficiencies

These photographs should be included in the building report. Inspectors should also record any deficiencies or other details that will be useful to them in completing work write-ups, cost estimates, etc.

All photographss should be labeled on the mount by building name and date. A list identifying the photographs should also be prepared.

MANAGEMENT COST AND PRIORITY SUMMARY

Deficiency Category	Priority 1 "Critical"	Priority 2 "Serious"	Priority 3 "Minor"	Category Subtotal
A. Site	$	$	$	$
B. Exterior Envelope				
C. Accessibility				
D. Public Health				
E. Fire/Life Safety				
F. Interior Envelope				
G. Electrical				
H. Heating/Ventilating/ Air-Conditioning				
I. Plumbing/Utility				
J. Function				
K. Other				
Total Estimate for Building				$_____

HOUSING INSPECTION CHECKLIST

GENERAL INFORMATION

Date _____

Park _____

Location in Park _____

Building # _____ LCS # _____

Available Documentation _____

_____

_____

Inspection Team Data _____

_____

_____

Members and Park Assistance _____

_____

_____

Date of Data Entry _____

Condition Description (as result of inspection) _____

_____

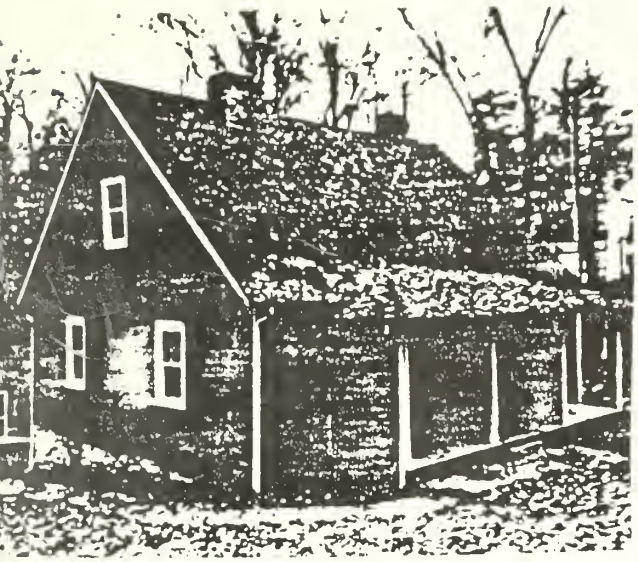
_____

_____

_____

_____

Rehabilitation Priority _____

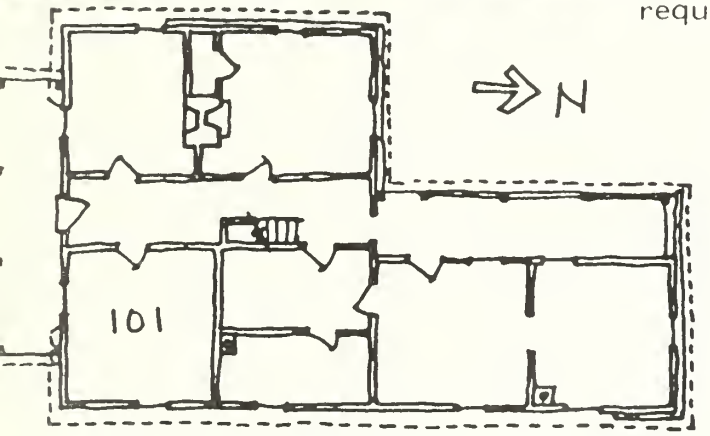


INSPECTION CHECKLIST
Park: _____
Mgmt. Unit: _____

Sheet _____ of _____ Date _____
Inspector _____
Instructions: Check every item in order. Indicate condition of every element.

1 = Stable Condition
2 = Slow deterioration, needs attention within 3-5 years
3 = Rapidly deteriorating, needs immediate attention

Use photo or plan to locate items requiring work.



Total square footage _____

blank space for additional photo, floor plan, or site plan

SUMMARY AND DETAILED CHECKLISTS

The following pages contain a sample summary feature checklist and a detailed checklist for each deficiency category to be used by those doing the actual inspections. The checklists are provided as guidelines for inspection. Adjustments must be made for features not included or not needed.

On the following checklists, ""MM Code" refers to the Maintenance Management System code.

A: SITE--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4900	General Building/ Site				
4950	General Site Planning/Design				
____	General Site Design				
4951	General Site Design: Control/Unity				
4920	Vehicular Access/ Circulation				
____	Vehicular Access/ Parking				
____	Vehicular Access/ Driveway				
4910	Pedestrian Access: Walkway				
____	Accessibility				
____	Community Amenities				
____	Site/Unit Relationship				
____	Outdoor Storage (on-site)				
____	Outdoor Storage (off-site)				
4930	Landscaping: Flora				

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4932	Landscaping: Grade				
____	Maintenance				
____	Maintenance Schedules				
4980	Other				

A: SITE--DETAILED CHECKLIST

MM Code	Feature Name
4900	General Building/Site
4950	General Site Planning/Design land-use compatibility general site organization residential character compatible with natural landforms location relative to surrounding park functions consistent with management documents (GMPs, DCPs) compatible with cultural, historical, natural environment CONDITION
____	General Site Design building/site integration solar orientation/optimization use of native plant material compatibility with park design theme utilization of views/vistas low maintenance landscape design CONDITION
4951	General Site Design: Control/Unity site detailing site furnishings housing units utility structures roads walks utilities CONDITION
4920	Vehicular Access/Circulation resident/visitor emergency vehicle delivery vehicle schoolbus CONDITION
____	Vehicular Access/Parking surface materials proximity to housing unit compatibility with landforms adequacy of spaces space for second auto, RV, boat CONDITION

MM Code	Feature Name
____	Vehicular Access/Driveway
	surface materials
	location/path
	CONDITION
4910	Pedestrian Access/Walkway
	surface materials
	width
	slope
	location/path
	covered or not
	CONDITION
____	Accessibility
	parking
	ramps/curbcuts
	access to each living unit
	access to all community amenities
	CONDITION
____	Community Amenities
	open space
	recreation facilities
	playgrounds
	group picnic/gathering
	community building
	storage
	CONDITION
____	Site/Unit Relationship
	access to/from unit
	circulation
	spatial articulation/definition
	privacy
	indoor/outdoor relationship
	personal yard space
	storage
	CONDITION
____	Outdoor Storage (on-site)
	autos
	RVs, boats, snowmobiles
	bicycles
	tools (garden, auto)
	pet area
	trash
	firewood
	CONDITION

MM Code	Feature Name
____	Outdoor Storage (off-site)
	autos
	RVs, boats, snowmobiles
	storage locker
	CONDITION
4930	Landscaping: Flora
	native vegetative communities
	park theme
	climatic requirements
	screening
	shading
	proximity to structures
	compatibility with landforms
	CONDITION
4932	Landscaping: Grade
	slope
	type/direction of site drainage
	watertable
	building perimeter drains
	grade/structure proximity--clearance to wood elements
	grade/finished floor level
	site/building designs work with grade
	CONDITION
____	Maintenance
	building
	open space
	ground cover
	plant material
	utility structures
	paved surfaces
	CONDITION
____	Maintenance Schedules
	landscape rehabilitation
	cutting/pruning
	watering
	mulching
	fertilizing
	aeration
	CONDITION
4980	Other

B: EXTERIOR ENVELOPE--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4400	Foundation: Footings				
4410	Foundation: Walls				
4420	Foundation: Piers				
4430	Foundation: Openings/ Ventilation/Radon				
4440	Foundation: Chimney				
4100	Exterior Walls: Structure				
4111	Walls: Insulation				
4110	Walls: Exterior Finish				
4115	Walls: Parapet				
4300	Roof				
4310	Roof: Surface Material				
4380	Roof: Insulation				
4320	Roof: Decking				
4330	Roof: Structure				
4370	Roof: Openings				
4351	Roof: Flashing				
4440	Roof: Chimneys				
4350	Roof: Drainage				
4362	Roof: Soffit				
4150	Exterior: Doors				

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4153	Exterior: Glazing				
4140	Exterior: Windows				
4142	Exterior: Storms				
____	Exterior Door/ Window: Screens				
4120	Exterior: Stairs/Ramps				
4130	Exterior: Porches/ Decks/Patios				
4160	Exterior: Ornamental				
4170	Exterior: General				
____	Other				

B: EXTERIOR ENVELOPE--DETAILED CHECKLIST

If drawings are available and found to be accurate, much of this information can be taken from them when an element is not visible.

MM Code	Feature Name	
4400	Foundation: Footings	
	size	number/linear feet
	materials	spacing
	CONDITION	
4410	Foundation: Walls	
	width/linear feet	moisture proofing
	materials	cracks/plumbness
	insulation	
	CONDITION	
4420	Foundation: Piers	
	size	spacing
	materials	cracks/plumbness
	number	
	CONDITION	
4430	Foundation: Openings/Ventilation/Radon	
	number/location	
	size	
	coverings	
	crawl space--average height	
	dampness	
	CONDITION	
4440	Foundation: Chimney	
	size	
	material	
	CONDITION	

MM
Code Feature Name

4100 Exterior Wall: Structure
materials
i.e., brick - bond pattern, glazed headers, rubbed bricks, gagued brick, type/condition of mortar, etc.
stone- type, coursing, appearance, type/condition of mortar, etc.
wood- framing type
other
thickness
spacing of members
linear feet
cracks/plumbness
CONDITION

4111 Walls: Insulation
type
thickness
R-value
CONDITION

4110 Walls: Exterior Finish
materials
i.e., exposed structure
paint/stain
siding - type, materials
shingles - color, exposure, material, patterns, shape, sawn, hand split, etc.
brick veneer - bond pattern, glazed headers, rubbed bricks, type/condition of mortar, etc.
stone veneer - type, coursing, appearance, type/condition of mortar, etc.
other
finish
paint/color scheme if important or unusual
vapor barriers
penetrations
CONDITION

4115 Walls: Parapet
material
height above roof
coping
flashing/counter flashing
CONDITION

MM Code	Feature Name
4300	Roof
4310	Roof: Surface Material material underlayment texture, pattern, color, if important or unusual CONDITION
4380	Roof: Insulation type thickness R-value CONDITION
4320	Roof: Decking material thickness CONDITION
4330	Roof: Structure material size/spacing of members truss/conventional accessible through attic access CONDITION
4370	Roof: Openings plumbing vents scuttles/roof access skylights cupolas CONDITION
4351	Roof: Flashing counter flashing material type, i.e., chimney, wall, parapet, roof, other (chimney and parapet flashings can be included here or, if space is not available, can be put under their respective elements) CONDITION

MM Code	Feature Name
4440	Roof: Chimneys number location material flashing/counter flashing height above roof CONDITION
4350	Roof: Drainage type of drainage system materials of gutters, downspouts, etc. splashblocks or other devices to divert water away from building length of gutter run number of downspouts and locations CONDITION
4362	Roof: Soffit material vents dimension of overhang(s) fascia CONDITION
4150	Exterior: Doors material style - peneled/flush, etc. glazing - within door, sidelights, transom, etc. decorative features finish decorative hardware CONDITION
4153	Exterior: Glazing single, double, triple, thermal obscure, wire, tinted glass decorative - stained, leaded, etc. CONDITION
4140	Exterior: Windows type of sash material finish shutters decorative hardware CONDITION

MM
Code — Feature Name

4142 — Exterior: Storms
storm windows/shutters/doors
material
finish
seasonal/permanent
attachment to window/door frame
CONDITION

____ — Exterior Door/Window: Screens
doors/windows
frame material
finish
seasonal/permanent
attachment to window/door frame
CONDITION

4120 — Exterior: Stairs/Ramps
location
material
finish
CONDITION (general description and location only - construction details to be listed under Fire/Life Safety and/or Handicapped Accessibility)

4130 — Exterior: Porches/Decks/Patios
location
materials
finish
screens
decorative elements
CONDITION

4160 — Exterior: Ornamental
decorative elements especially historic details
i.e., window/door trim
cornice
porches
other
shutters
CONDITION

4170 — Exterior: General
termite/bug control
last treatment date

____ — Other

C: ACCESSIBILITY--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4771	Parkwide: Accessibility Plan				
4772	Exterior: Designated Parking				
4773	Exterior: Entry Route				
4___	Accessible Entry				
4774	Interior: Restrooms				
4775	Interior: Drinking Fountains				
4776	Single Family Housing Units				
4777	Other				

C: ACCESSIBILITY--DETAILED CHECKLIST

MM Code	Feature Name	
4771	Parkwide: Accessibility Plan refer to housing	
4772	Exterior: Designated Parking location marked for handicapped use size of spaces and access aisles slope of access aisles marked access aisles surface material direction signs curb cuts -	 logical locations slope surface materials transition points general design
4773	Exterior: Entry Route marked entry path -	 ramps/stairs/walkways abrupt changes--dimensions clear width slope passing or rest areas in walks surface materials grating material dimensions handrails
____	Accessible Entry location in relation to parking connection to accessible walk to HC parking or public street doorways -	 width direction of swing type/material maneuvering clearances thresholds hardware design of bottom rail of door
	ramps -	appropriate landings see also Accessibility: general

MM Code	Feature Name
4774	Interior: Restrooms size, layout of stalls access to stalls height of HC fixtures grab bars HC identification on door general design of room and door locations (unobstructed 5 feet diameter floor space for wheelchair) HC accessors
4775	Interior: Drinking Fountains height controls clearance location
____	Single Family Housing Units consider adaptability of each unit
4777	Other

D: PUBLIC HEALTH--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4781	Water Treatment: Domestic Water				
4782	Water Treatment: Wastewater				
4783	Refuse: Collection				
4784	Refuse: Disposal				
4789	Hazardous Waste/ Material				
____	Radon				
4790	Insect Infestation				
____	Other				

D: PUBLIC HEALTH--DETAILED CHECKLIST

MM Code	Feature Name
4781	Water Treatment: Domestic Water softeners chlorination city or park supplied other testing/testing responsibility
4782	Water Treatment: Wastewater septic tanks--size/leaching field city sewer lagoons other testing/testing responsibility
4783	Refuse: Collection who, into what
4784	Refuse: Disposal landfill--city/county/private/NPS removed by private contractor/NPS/city/county other
4789	Hazardous Waste/Material proximity to
____	Radon testing retrofit retest after rehabilitation
____	Insect Infestation
4790	Other

E: FIRE/LIFE SAFETY--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4711	Lighting: Emergency				
471	Lighting: Egress/ Exit Discharge				
4712	Egress: Exit Signage				
4713	Egress: Path				
4715	Egress: Distance				
4716	Egress: Finish				
4717	Egress: Furnishings				
4718	Egress: Stairs/Ramps				
4719	Egress: Doors/ Hardware				
____	Egress: Handrail				
4720	Detection: Intrusion Detection System				
4730	Detection: Fire Detection System				
4732	Detection: Pull Station				
4740	Detection: Emergency Phone				
4733	Detection: Annunciation				
4757	Extinguishing: Extinguishers				
4751	Extinguishing: Standpipes				

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4752	Extinguishing: Sprinklers				
4756	Extinguishing: Fire Stops				
____	Other				

E: FIRE/LIFE SAFETY--DETAILED CHECKLIST

MM Code	Feature Name
4711	Lighting: Emergency type power source location
____	Lighting: Egress/Exit Discharge how is path lit under normal circumstances?
4712	Egress: Exit Signage type of sign i.e., graphic lighted location(s) size
4713	Egress: Path what is the path of egress? classification of occupancy occupancy load hazard of contents width of corridors types of spaces passed through fire escape(s) - design, location(s), path are all components of means of egress of proper size for capacity of spaces and building?
4715	Egress: Distance maximum travel distance from any point in the building to the point of exit access length of any dead-end corridors type of exit number of exits
4716	Egress: Finish class A, B, C - if unknown, list finishes
4717	Egress: Furnishings what lies in the path of travel?

MM Code	Feature Name
4718	Egress: Stairs/Ramps material width riser/tread/nosing dimensions slope landing width swing of doors that open onto stair/ramp fire separation and protection
4719	Egress: Doors/Hardware material thickness label/fire rating width capacity direction of swing type of hardware, hinges, closures, alarm devices, signage
____	Egress: Handrail height above stair nose/ramp surface width guard design diameter distance from wall top and bottom extensions
4720	Detection: Intrusion Detection System type of burglar alarm automatic police notification or other direct notification
4730	Detection: Fire Detection System type of system automatic fire department notification or other direct notification
4732	Detection: Pull Station location number (if not required state "none required by code")
4740	Detection: Emergency Phone location ties to other emergency faiclities (if not required state "none required by code")
4733	Detection: Annunciation type audible/visual

MM Code	Feature Name
4757	Extinguishing: Extinguishers type - appropriateness for potential hazard size location inspection date
4751	Extinguishing: Standpipes location classification dry-pipe/wet-pipe seasonal/year-round - give dates of drain-off (if not required state "none required by code")
4752	Extinguishing: Sprinklers locations fire extinguishing agent seasonal/year-round - give dates of drain-off (if not requried state "none required by code")
4756	Extinguishing: Fire Stops within frame construction fire barriers i.e., between different occupancies or hazardous areas
____	Other

F: INTERIOR ENVELOPE--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4213	Floor: Structure				
4212	Floor: Decking				
4210	Floor: Flooring Material/Finish				
____	Floor: Coverings/ Finish				
4211	Floor: Insulation				
4222	Walls: Structure				
4220	Walls: Finish				
4232	Ceilings: Structure				
4230	Ceilings: Finish				
4240	Doors: Type				
4270	Interior: Stairs - Type				
4223	Interior: Trim				
4520	Furnishings: Built-in Counter and Cabinet Tops				
____	Window Covering				
____	Cabinets				
____	Other				

F: INTERIOR ENVELOPE--DETAILED CHECKLIST

Note: If drawings are available and found to be accurate much of this information can be taken from them when an element is not visible.

MM Code	Feature Name
4213	Floor: Structure material size/spacing of members/thickness of slab clearance from grade accessible through crawl space CONDITION
4212	Floor: Decking sub-floor material thickness CONDITION
4210	Floor: Flooring Material/Finish finish floor material CONDITION
____	Floor: Coverings/Finish type i.e., carpet, wood, tile, linoleum other CONDITION
4211	Floor: Insulation type thickness R-value vapor barrier CONDITION
4222	Walls: Structure material size/spacing of members load bearing - to be indicated on drawings CONDITION

MM
Code — Feature Name

4220 — Walls: Finish
finish material
type of lath
sheathing
paint
wallpaper
CONDITION

4232 — Ceilings: Structure
material
size/spacing of members
height
CONDITION

4230 — Ceilings: Finish
material
type of
sheathing
CONDITION

4240 — Doors: Type
material
finish
style - paneled, flush, hollow, solid
glazing
CONDITION

4270 — Interior: Stairs - Type
material
location
if egress stair see section on Handicapped Accessibility
CONDITION

4223 — Interior: Trim
decorative elements
i.e., doors/window trim
baseboards
cornice
ceiling finishes
chair rail
picture molding
paneling
other
materials
finish
CONDITION

MM Code	Feature Name
4520	Furnishings: Built-in Counter and Cabinet Tops
	tile
	composition
	wood
	other
	CONDITION
____	Window Covering
	shades
	curtains
	blinds
	other
	CONDITION
____	Cabinets
	material
	finish
	hardware
	CONDITION
____	Other

G: ELECTRICAL--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4630	Incoming Service: Transformer/Lines				
4631	Incoming Service: Service Lines				
4632	Incoming Service: Metering				
4633	Incoming Service: Ground				
4634	Main Distr Panel: Main Connection				
4635	Main Distr Panel: Service Capacity/ Conductor Size				
4636	Main Distr Panel: Access/Marking				
4637	Additional Power/ Lighting Panels: Main Connection				
4638	Additional Power/ Lighting Panels: Access/Marking				
4639	Additional Power/ Lighting Panels: Service Capacity				
4641	Electrical Devices: Overload Protection				
4642	Electrical Devices: Lightning Protection				
4643	Electrical Network: Outlets				

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
____	Electrical Network: Switches				
4645	Electrical Network: Conductors/Raceway				
4646	Electrical Network: Lighting Type				
4647	Electrical: Telephone Network				
4648	Television/Sound				
4649	Electrical Network: Energy Retrofit				

G: ELECTRICAL--DETAILED CHECKLIST

MM Code	Feature Name
4630	Incoming Service: Transformer/Lines installation (pole mounted or pad mounted) utility company
4631	Incoming Service: Service Lines size installation of service lines (service drop, service lateral, etc.) capacity and voltage of main panel CONDITION
4632	Incoming Service: Metering check for meter list power company
4633	Incoming Service: Ground . size of ground wire installation (ground rod or water main) age CONDITION
4634	Main Distr Panel: Main Connection age CONDITION
4635	Main Distr Panel: Service Capacity/Conductor Size size of conductors age CONDITION
4636	Main Distr Panel: Access/Marking location access to panel directory for proper identification
4637	Additional Power/Lighting Panels: Main Connection age CONDITION
4638	Additional Power/Lighting Panels: Access/Marking location access to panel directory for proper identification

MM Code	Feature Name
4639	Additional Power/Lighting Panels: Service Capacity list number of panels and capacity
4641	Electrical Devices: Overload Protection fused disconnect switch, breakers, etc. age CONDITION
4642	Electrical Devices: Lightning Protection lightning protection (lightning rod, arrester, etc.) CONDITION
4643	Electrical Network: Outlets type (single, duplex, etc.) age ground CONDITION
____	Electrical Network: Switches type (push button, toggle switch, etc.) age CONDITION
4645	Electrical Network: Conductors/Raceway type of conductors (single insulated, plastic sheathed cable, etc.) age CONDITION
4646	Electrical Network: Lighting Type type (fluorescent or incandescent) age original/historic design CONDITION
4647	Electrical: Telephone Network type (public or private)
4648	Television/Sound wiring
4649	Electrical Network: Energy Retrofit rewiring, timers, etc.

H: HEATING/VENTILATING/AIR-CONDITIONING-- SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority- Severe/ Critical/ Minor	Estimate
4651	Heating: Equipment				
4652	Heating: Piping Network				
4653	Heating: Pumps				
4654	Heating: Boilers				
4655	Heating: Energy Retrofit				
4656	Heating: Other				
4657	Cooling: Equipment				
4658	Cooling: Piping				
4659	Cooling: Pumps				
4660	Cooling: Energy Retrofit				
4662	Ventilating: Air Handlers/ Exhaust Fans				
4663	Ventilation: Duct Work				
4664	Ventilation: Stacks/ Chimneys/Vents				

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4665	Ventilation: Energy Retrofit				
4666	Ventilation: Fans/ Other				
4667	Temperature Control: Thermostats				
4668	Temperature Control: Energy Retrofit				
4669	HVAC Control: Air Compressors				
4670	Refrigeration: Systems/Units				
4671	HVAC: Air Control Devices				
4672	HVAC: Water Treatment				
____	Solar Heating				
4674	Other				

H: HEATING/VENTILATING/AIR-CONDITIONING-- DETAILED CHECKLIST

MM Code	Feature Name
4651	Heating: Equipment location manufacturer type size age CONDITION
4652	Heating: Piping Network type of piping (copper, galvanized iron, etc.) size age CONDITION
4653	Heating: Pumps location manufacturer type (condensate return, h.w. circulating, etc.) hp age CONDITION
4654	Heating: Boilers location manufacturer type (steam or hydronic) capacity fuel age CONDITION
4655	Heating: Energy Retrofit insulated piping network, timers, etc.
4656	Heating: Other additional heating equipment and comments
4657	Cooling: Equipment location manufacturer type size age CONDITION

MM Code	Feature Name
4658	Cooling: Piping type of piping (copper, galvanized iron, etc.) size age CONDITION
4659	Cooling: Pumps location manufacturer type (c.w. circulating, condenser water, etc.) hp age CONDITION
4660	Cooling: Energy Retrofit insulated piping network, timers, etc.
4662	Ventilating: Air Handlers/Exhaust Fans location manufacturer type size age CONDITION
4663	Ventilation: Duct Work materials (galvanized steel, aluminum, etc.) age CONDITION
4664	Ventilation: Stacks/Chimneys/Vents materials (brick, galvanized steel, etc.) age size CONDITION
4665	Ventilation: Energy Retrofit temperature controllers, insulated duct work, timers, etc.)
4666	Ventilation: Fans/Other additional ventilation equipment and comments location manufacturer type size age CONDITION

MM Code	Feature Name
4667	Temperature Control: Thermostats location manufacturer type (electric or pneumatic) age CONDITION
4668	Temperature Control: Energy Retrofit outside T-Stat, day-night T-Stat, timers, etc.
4669	HVAC Control: Air Compressors location manufacturer type size age CONDITION
4670	Refrigeration: Systems/Units location manufacturer type size age CONDITION
4671	HVAC: Air Control Devices manufacturer type (mixing box, dampers) age CONDITION
4672	HVAC: Water Treatment contractor type (hydronic system, steam system, etc.) CONDITION
____	Solar Heating passive active other CONDITION
4674	Other

I: PLUMBING/UTILITY--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
4611	Water: Metering				
4612	Water: Piping Network				
4613	Water: Pumps				
4614	Water: Equipment				
4615	Water: Hot Water Heating				
4616	Water: Fixtures				
4617	Water: Energy Retrofit				
4618	Wastewater: Piping Network				
4619	Wastewater: Pumps				
4620	Fuel: Piping Network				
4621	Fuel: Type				
4622	Fuel: Storage				

I: PLUMBING/UTILITY--DETAILED CHECKLIST

MM Code	Feature Name
4611	Water: Metering check for meter in system list water works company
4612	Water: Piping Network type of piping (copper, galvanized iron, etc.) age size CONDITION
4613	Water: Pumps location manufacturer type (booster, h.w. circulating, etc.) hp age CONDITION
4614	Water: Equipment additional water equipment location manufacturer type (water softener, storage tank, etc.) age CONDITION
4615	Water: Hot Water Heating location manufacturer type (electric, gas, etc.) age capacity safety valves CONDITION
4616	Water: Fixtures type (water closet, lavatory, urinal, etc.) number adequate number of fixtures based on occupant load of building age original/historic design CONDITION

MM
Code — Feature Name

4617 — Water: Energy Retrofit
insulated water heater, timers, insulated piping, etc.

4618 — Wastewater: Piping Network
type of piping (cast iron, galvanized iron, PVC, lead solder, etc.)
age
size
CONDITION

4619 — Wastewater: Pumps
location
manufacturer
type (sewage ejection, sump, etc.)
hp
age
CONDITION

4620 — Fuel: Piping Network
type of piping (cast iron, galvanized iron, PDC, lead solder, etc.)
age
size
CONDITION

4621 — Fuel: Type
type (natural gas, oil, etc.)

4622 — Fuel: Storage
type of equipment
plumbing
size
age
CONDITION

J: FUNCTION--SUMMARY CHECKLIST

MM Code	Feature	Deficiency	Condition 1, 2, 3	Priority-Severe/ Critical/ Minor	Estimate
____	Room Size				
____	Ceiling Height				
____	Privacy (Interior/ Exterior)				
____	Circulation				
____	Light and Ventilation				
____	Kitchen				
____	Baths				
____	Laundry				
____	Interior Storage				
____	Exterior Storage				
____	Other				

J: FUNCTION--DETAILED CHECKLIST*

*Refer to CABO and UBC for applicable functional requirements.

MM Code | Feature Name

____ Room Size
7'0" minimum width
70 sq ft minimum/habitable room
(50 sq ft minimum for kitchen)
150 sq ft minimum size for at least one room
CONDITION

____ Ceiling Height
7'6" minimum for habitable rooms
7'0" minimum for kitchen/baths/halls
CONDITION

____ Privacy (Interior/Exterior)
bedrooms - acoustical and visual separation from living and working areas of unit as well as from adjacent units
bathroom - screened from living area
kitchen - screened from living area
proximity of unit to roads, walks, trails
screening from common areas and adjacent units
CONDITION

____ Circulation
main entry provides easy access to living area
secondary entrance provides easy access to kitchen
bedrooms and bathrooms are accessible without travel through other rooms
CONDITION

____ Light and Ventilation
glazing = minimum of 10% of unit floor area
ventilation = minimum of ½ of required glazed area or mechanical system capable of 2 air changes/hour (5/hour for bathrooms)
CONDITION

____ Kitchen
refrigerator, sink, and stove form convenient work triangle
adequate counterspace/number of bedrooms
adequate cabinet space/number of bedrooms
adequate counterspace adjacent to refrigerator, sink, and stove
adequate light and ventilation
proximity of eating space
CONDITION

MM Code	Feature Name
____	Baths 1-1½ baths for 2-bedroom unit 1½ to 1-3/4 baths for 3-bedroom unit 1-3/4 to 2 baths for 4-bedroom unit adequate space for access/use of fixtures cleanable, durable finishes CONDITION
____	Laundry hookups provided for washer/dryer/utility sink proximity to kitchen/bedrooms
____	Interior Storage adequate bedrooms, linen, entry closet space bulk household supply storage off-season clothing storage children's toys and games storage CONDITION
____	Exterior Storage parking space for primary vehicle professional equipment storage personal tools (garden, auto repair) storage bicycle storage parking space for second vehicle
____	Other

K: OTHER FEATURES

MM
Code Feature Name

Note: Other or unique elements not listed otherwise.

INTRODUCTION

The primary references for rehabilitation of historic buildings are the "Standards for Rehabilitation." The "Guidelines for Rehabilitating Historic Buildings" were developed in 1977 to help managers apply these standards during the project planning process. The guidelines pertain to historic buildings of all sizes, materials, occupancy, and construction types; they also apply to both interior and exterior work as well as to exterior additions. Approaches, treatments, and techniques that are consistent with the standards are listed in the "recommended" column on the left; those approaches, treatments, and techniques that could adversely affect a building's historic character are listed in the "not recommended" column on the right.

The "Guidelines for Rehabilitating Historic Buildings" can be applied not only to historic buildings but to any rehabilitation project in which preservation of architectural character and economy is a concern. Application of the guidelines follows a basic three-step process outlined in the following checklist.

1. Identify materials and features (architectural character) that are important and should be retained in the process of rehabilitation

   Look at the building from a distance and identify the following:

   - setting and landscaping
   - building shape
   - roof form
   - character and placement of windows
   - projections from the building mass

   Look at the building from arm's length and identify the following:

   - type and detailing of materials
   - color and surface finishes
   - trim and secondary building features

   Look at the interior of the building and identify the following:

   - significant individual spaces
   - relationships between spaces
   - trim and special features
   - type and detailing of materials
   - color and surface finishes

2. Determine the most appropriate treatment for features and materials that are to be retained.

   In general, the order of preference for treatments proceeds from maintenance to repair to replacement according to the level of deterioration or damage of each item. This is also an appropriate point at which to consider the functional adequacy of a feature or material. Each section of the guideline discusses treatments in a parallel order--from the least destructive to the most destructive. The guideline contains the following 12 basic sections:

   Masonry
   Wood
   Architectural Metals
   Roofs
   Windows
   Entrances and Porches
   Storefronts
   Structural Systems
   Interior Spaces, Features, and Finishes
   Mechanical Systems
   Building Site
   District/Neighborhood

3. Resolve any remaining issues that are required to ensure that the building meets contemporary standards for safety and utility.

   The guideline contains three additional sections to provide guidance in these areas:

   Health and Safety Code Requirements
   Energy Retrofitting
   New Additions to Historic Buildings

Portions of the guidelines that may be of particular value when rehabilitating buildings for housing follow.

PORTIONS OF THE "GUIDELINES FOR REHABILITATING HISTORIC BUILDINGS"

12

BUILDING EXTERIOR

Masonry: Brick, stone, terra cotta, concrete, adobe, stucco and mortar

Masonry features (such as brick cornices and door pediments, stone window architraves, terra cotta brackets and railings) as well as masonry surfaces (modelling, tooling, bonding patterns, joint size, and color) may be important in defining the historic character of the building. It should be noted that while masonry is among the most durable of historic building materials, it is also the most susceptible to damage by improper maintenance or repair techniques and by harsh or abrasive cleaning methods. Most preservation guidance on masonry thus focuses on such concerns as cleaning and the process of repointing.

Recommended	Not Recommended
Identifying, retaining, and preserving masonry features that are important in defining the overall historic character of the building such as walls, brackets, railings, cornices, window architraves, door pediments, steps, and columns; and joint and unit size, tooling and bonding patterns, coatings, and color.	Removing or radically changing masonry features which are important in defining the overall historic character of the building so that, as a result, the character is diminished.
	Replacing or rebuilding a major portion of exterior masonry walls that could be repaired so that, as a result, the building is no longer historic and is essentially new construction.
	Applying paint or other coatings such as stucco to masonry that has been historically unpainted or uncoated to create a new appearance.
	Removing paint from historically painted masonry.
	Radically changing the type of paint or coating or its color.
Protecting and maintaining masonry by providing proper drainage so that water does not stand on flat, horizontal surfaces or accumulate in curved decorative features.	Failing to evaluate and treat the various causes of mortar joint deterioration such as leaking roofs or gutters, differential settlement of the building, capillary action, or extreme weather exposure.

Masonry (continued)

Recommended	Not Recommended
Cleaning masonry only when necessary to halt deterioration or remove heavy soiling.	Cleaning masonry surfaces when they are not heavily soiled to create a new appearance, thus needlessly introducing chemicals or moisture into historic materials.
Carrying out masonry surface cleaning tests after it has been determined that such cleaning is necessary. Tests should be observed over a sufficient period of time so that both the immediate effects and the long range effects are known to enable selection of the gentlest method possible.	Cleaning masonry surfaces without testing or without sufficient time for the testing results to be of value.
Cleaning masonry surfaces with the gentlest method possible, such as low pressure water and detergents, using natural bristle brushes.	Sandblasting brick or stone surfaces using dry or wet grit or other abrasives. These methods of cleaning permanently erode the surface of the material and accelerate deterioration.
	Using a cleaning method that involves water or liquid chemical solutions when there is any possibility of freezing temperatures.
	Cleaning with chemical products that will damage masonry, such as using acid on limestone or marble, or leaving chemicals on masonry surfaces.
	Applying high pressure water cleaning methods that will damage historic masonry and the mortar joints.
Inspecting painted masonry surfaces to determine whether repainting is necessary.	Removing paint that is firmly adhering to, and thus protecting, masonry surfaces.
Removing damaged or deteriorated paint only to the next sound layer using the gentlest method possible (e.g., handscraping) prior to repainting.	Using methods of removing paint which are destructive to masonry, such as sandblasting, application of caustic solutions, or high pressure waterblasting.
Applying compatible paint coating systems following proper surface preparation.	Failing to follow manufacturers' product and application instructions when repainting masonry.
Repainting with colors that are historically appropriate to the building and district.	Using new paint colors that are inappropriate to the historic building and district.

Masonry (continued)

Recommended	Not Recommended
Evaluating the overall condition of the masonry to determine whether more than protection and maintenance are required, that is, if repairs to the masonry features will be necessary.	Failing to undertake adequate measures to assure the preservation of masonry features.
Repairing masonry walls and other masonry features by repointing the mortar joints where there is evidence of deterioration such as disintegrating mortar, cracks in mortar joints, loose bricks, damp walls, or damaged plasterwork.	Removing nondeteriorated mortar from sound joints, then repointing the entire building to achieve a uniform appearance.
Removing deteriorated mortar by carefully hand-raking the joints to avoid damaging the masonry.	Using electric saws and hammers rather than hand tools to remove deteriorated mortar from joints prior to repointing.
Duplicating old mortar in strength, composition, color, and texture.	Repointing with mortar of high portland cement content (unless it is the content of the historic mortar). This can often create a bond that is stronger than the historic material and can cause damage as a result of the differing coefficient of expansion and the differing porosity of the material and the mortar.
	Repointing with a synthetic caulking compound.
	Using a "scrub" coating technique to repoint instead of traditional repointing methods.
Duplicating old mortar joints in width and in joint profile.	Changing the width or joint profile when repointing.
Repairing stucco by removing the damaged material and patching with new stucco that duplicates the old in strength, composition, color, and texture.	Removing sound stucco; or repairing with new stucco that is stronger than the historic material or does not convey the same visual appearance.
Using mud plaster as a surface coating over unfired, unstabilized adobe because the mud plaster will bond to the adobe.	Applying cement stucco to unfired, unstabilized adobe. Because the cement stucco will not bond properly, moisture can become entrapped between materials, resulting in accelerated deterioration of the adobe.

Masonry (continued)

Recommended	Not Recommended
Repairing masonry features by patching, piecing-in, or consolidating the masonry using recognized preservation methods. Repair may also include the limited replacement in kind--or with compatible substitute material--of those extensively deteriorated or missing parts of masonry features when there are surviving prototypes such as terra-cotta brackets or stone balusters.	Replacing an entire masonry feature such as a cornice or balustrade when repair of the masonry and limited replacement of deteriorated or missing parts are appropriate. Using a substitute material for the replacement part that does not convey the visual appearance of the surviving parts of the masonry feature or that is physically or chemically incompatible.
Applying new or non-historic surface treatments such as water-repellent coatings to masonry only after repointing and only if masonry repairs have failed to arrest water penetration problems.	Applying waterproof, water-repellent, or non-historic coatings such as stucco to masonry as a substitute for repointing and masonry repairs. Coatings are frequently unnecessary, expensive, and may change the appearance of historic masonry as well as accelerate its deterioration.
Replacing in kind an entire masonry feature that is too deteriorated to repair--if the overall form and detailing are still evident--using the physical evidence to guide the new work. Examples can include large sections of a wall, a cornice, balustrade, column, or stairway. If using the same kind of material is not technically or economically feasible, then a compatible subsitute material may be considered.	Removing a masonry feature that is unrepairable and not replacing it; or replacing it with a new feature that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and installing a new masonry feature such as steps or a door pediment when the historic feature is completely missing. It may be an accurate restoration using historical, pictorial, and physical documentation; or be a new design that is compatible with the size, scale, material, and color of the historic building.	Creating a false historical appearance because the replaced masonry feature is based on insufficient historical, pictorial, and physical documentation. Introducing a new masonry feature that is incompatible in size, scale, material and color.

Wood: Clapboard, weatherboard, shingles, and other wooden siding and decorative elements

Because it can be easily shaped by sawing, planing, carving, and gouging, wood is the most commonly used material for architectural features such as clapboards, cornices, brackets, entablatures, shutters, columns and balustrades. These wooden features--both functional and decorative--may be important in defining the historic character of the building and thus their retention, protection, and repair are of particular importance in rehabilitation projects.

Recommended	Not Recommended
Identifying, retaining, and preserving wood features that are important in defining the overall historic character of the building such as siding, cornices, brackets, window architraves, and doorway pediments; and their paints, finishes, and colors.	Removing or radically changing wood features which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Removing a major portion of the historic wood from a facade instead of repairing or replacing only the deteriorated wood, then reconstructing the facade with new material in order to achieve a uniform or "improved" appearance. Radically changing the type of finish or its color or accent scheme so that the historic charcter of the exterior is diminished. Stripping historically painted surfaces to bare wood, then applying clear finishes or stains in order to create a "natural look." Stripping paint or varnish to bare wood rather than repairing or reapplying a special finish, i.e., a grained finish to an exterior wood feature such as a front door.
Protecting and maintaining wood features by providing proper drainage so that water is not allowed to stand on flat, horizontal surfaces or accumulate in decorative features.	Failing to identify, evaluate, and treat the causes of wood deterioration, including faulty flashing, leaking gutters, cracks and holes in siding, deteriorated caulking in joints and seams, plant material growing too close to wood surfaces, or insect or fungus infestation.

Wood (continued)

Recommended	Not Recommended
Applying chemical preservatives to wood features such as beam ends or outriggers that are exposed to decay hazards and are traditionally unpainted.	Using chemical preservatives such as creosote which can change the appearance of wood features unless they were used historically.
Retaining coatings such as paint that help protect the wood from moisture and ultraviolet light. Paint removal should be considered only where there is paint surface deterioration and as part of an overall maintenance program which involves repainting or applying other appropriate protective coatings.	Stripping paint or other coatings to reveal bare wood, thus exposing historically coated surfaces to the effects of accelerated weathering.
Inspecting painted wood surfaces to determine whether repainting is necessary or if cleaning is all that is required.	Removing paint that is firmly adhering to, and thus, protecting wood surfaces.
Removing damaged or deteriorated paint to the next sound layer using the gentlest method possible (handscraping and handsanding), then repainting.	Using destructive paint removal methods such as a propane or butane torches, sandblasting or waterblasting. These methods can irreversibly damage historic woodwork.
Using with care electric hot-air guns on decorative wood features and electric heat plates on flat wood surfaces when paint is so deteriorated that total removal is necessary prior to repainting.	Using thermal devices improperly so that the historic woodwork is scorched.
Using chemical strippers primarily to supplement other methods such as handscraping, handsanding and the above-recommended thermal devices. Detachable wooden elements such as shutters, doors, and columns may--with the proper safeguards--be chemically dip-stripped.	Failing to neutralize the wood thoroughly after using chemicals so that new paint does not adhere. Allowing detachable wood features to soak too long in a caustic solution so that the wood grain is raised and the surface roughened.
Applying compatible paint coating systems following proper surface preparation.	Failing to follow manufacturers' product and application instructions when repainting exterior woodwork.
Repainting with colors that are appropriate to the historic building and district.	Using new colors that are inappropriate to the historic building or district.
Evaluating the overall condition of the wood to determine whether more than protection and maintenance are required, that is, if repairs to wood features will be necessary.	Failing to undertake adequate measures to assure the preservation of wood features.

Wood (continued)

Recommended	Not Recommended
Repairing wood features by patching, piecing-in, consolidating, or otherwise reinforcing the wood using recognized preservation methods. Repair may also include the limited replacement in kind--or with compatible substitute material--of those extensively deteriorated or missing parts of features where there are surviving prototypes such as brackets, moldings, or sections of siding.	Replacing an entire wood feature such as a cornice or wall when repair of the wood and limited replacement of deteriorated or missing parts are appropriate. Using substitute material for the replacement part that does not convey the visual appearance of the surviving parts of the wood feature or that is physically or chemically incompatible.
Replacing in kind an entire wood feature, that is too deteriorated to repair--if the overall form and detailing are still evident--using the physical evidence to guide the new work. Examples of wood features include a cornice, entablature or balustrade. If using the same kind of material is not technically or economically feasible, then a compatible substitute material may be considered.	Removing an entire wood feature that is unrepairable and not replacing it; or replacing it with a new feature that does not convey the same visual appearance.

The following work is highlighted because it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and installing a new wood feature such as a cornice or doorway when the historic feature is completely missing. It may be an accurate restoration using historical, pictorial, and physical documentation; or be a new design that is compatible with the size, scale, material, and color of the historic building.	Creating a false historic appearance because the replaced wood feature is based on insufficient historical, pictorial, and physical documentation. Introducing a new wood feature that is incompatible in size, scale, material, and color.

Architectural Metals: Cast iron, steel, pressed tin, copper, aluminum, and zinc

Architectural metal features--such as cast-iron facades, porches, and steps; sheet metal cornices, roofs, roof cresting and storefronts; and cast or rolled metal doors, window sash, entablatures, and hardware--are often highly decorative and may be important in defining the overall historic character of the building. Their retention, protection, and repair should be a prime consideration in rehabilitation projects.

Recommended	Not Recommended
Identifying, retaining, and preserving architectural metal features such as columns, capitals, window hoods, or stairways that are important in defining the overall historic character of the building; and their finishes and colors.	Removing or radically changing architectural metal features which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Removing a major portion of the historic architectural metal from a facade instead of repairing or replacing only the deteriorated metal, then reconstructing the facade with new material in order to create a uniform, or "improved" appearance. Radically changing the type of finish or its historic color or accent scheme.
Protecting and maintaining architectural metals from corrosion by providing proper drainage so that water does not stand on flat, horizontal surfaces or accumulate in curved, decorative features.	Failing to identify, evaluate, and treat the causes of corrosion, such as moisture from leaking roofs or gutters. Placing incompatible metals together without providing a reliable separation material. Such incompatibility can result in galvanic corrosion of the less noble metal, e.g., copper will corrode cast iron, steel, tin, and aluminum.
Cleaning architectural metals, when necessary, to remove corrosion prior to repainting or applying other appropriate protective coatings.	Exposing metals which were intended to be protected from the environment. Applying paint or other coatings to metals such as copper, bronze, or stainless steel that were meant to be exposed.

Architectural Metals (continued)

Recommended	Not Recommended
Identifying the particular type of metal prior to any cleaning procedure and then testing to assure that the gentlest cleaning method possible is selected or determining that cleaning is inappropriate for the particular metal.	Using cleaning methods which alter or damage the historic color, texture, and finish of the metal; or cleaning when it is inappropriate for the metal. Removing the patina of historic metal. The patina may be a protective coating on some metals, such as bronze or copper, as well as a significant historic finish.
Cleaning soft metals such as lead, tin, copper, terneplate, and zinc with appropriate chemical methods because their finishes can be easily abraded by blasting methods.	Cleaning soft metals such as lead, tin, copper, terneplate, and zinc with grit blasting which will abrade the surface of the metal.
Using the gentlest cleaning methods for cast iron, wrought iron, and steel--hard metals--in order to remove paint buildup and corrosion. If handscraping and wire brushing have proven ineffective, low pressure dry grit blasting may be used as long as it does not abrade or damage the surface.	Failing to employ gentler methods prior to abrasively cleaning cast iron, wrought iron or steel; or using high pressure grit blasting.
Applying appropriate paint or other coating systems after cleaning in order to decrease the corrosion rate of metals or alloys.	Failing to re-apply protective coating systems to metals or alloys that require them after cleaning so that accelerated corrosion occurs.
Repainting with colors that are appropriate to the historic building or district.	Using new colors that are inappropriate to the historic building or district.
Applying an appropriate protective coating such as lacquer to an architectural metal feature such as a bronze door which is subject to heavy pedestrian use.	Failing to assess pedestrian use or new access patterns so that architectural metal features are subject to damage by use or inappropriate maintenance such as salting adjacent sidewalks.
Evaluating the overall condition of the architectural metals to determine whether more than protection and maintenance are required, that is, if repairs to features will be necessary.	Failing to undertake adequate measures to assure the preservation of architectural metal features.

Architectural Metals (continued)

Recommended	Not Recommended
Repairing architectural metal features by patching, splicing, or otherwise reinforcing the metal following recognized preservation methods. Repairs may also include the limited replacement in kind--or with a compatible substitute material--of those extensively deteriorated or missing parts of features when there are surviving prototypes such as porch balusters, column capitals or bases; or porch cresting.	Replacing an entire architectural metal feature such as a column or a balustrade when repair of the metal and limited replacement of deteriorated or missing parts are appropriate.
Replacing in kind an entire architectural metal feature that is too deteriorated to repair--if the overall form and detailing are still evident--using the physical evidence to guide the new work. Examples could include cast iron porch steps or steel sash windows. If using the same kind of material is not technically or economically feasible, then a compatible substitute material may be considered.	Using a substitute material for the replacement part that does not convey the visual appearance of the surviving parts of the architectural metal feature or is that physically or chemically incompatible. Removing an architectural metal feature that is unrepairable and not replacing it; or replacing it with a new architectural metal feature that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and installing a new architectural metal feature such as a sheet metal cornice or cast iron capital when the historic feature is completely missing. It may be an accurate restoration using historical, pictorial, and physical documentation; or be a new design that is compatible with the size, scale, material, and color of the historic building.	Creating a false historic appearance because the replaced architectural metal feature is based on insufficient historical, pictorial, and physical documentation. Introducing a new architectural metal feature that is incompatible in size, scale, material, and color.

Roofs

The roof--with its shape; features such as cresting, dormers, cupolas, and chimneys; and the size, color, and patterning of the roofing material--can be extremely important in defining the building's overall historic character. In addition to the design role it plays, a weathertight roof is essential to the preservation of the entire structure; thus, protecting and repairing the roof as a "cover" is a critical aspect of every rehabilitation project.

Recommended	Not Recommended
Identifying, retaining, and preserving roofs--and their functional and decorative features--that are important in defining the overall historic character of the building. This includes the roof's shape, such as hipped, gambrel, and mansard; decorative features such as cupolas, cresting, chimneys, and weathervanes; and roofing material such as slate, wood, clay tile, and metal, as well as its size, color, and patterning.	Radically changing, damaging, or destroying roofs which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Removing a major portion of the roof or roofing material that is repairable, then reconstructing it with new material in order to create a uniform, or "improved" appearance. Changing the configuration of a roof by adding new features such as dormer windows, vents, or skylights so that the historic character is diminished. Stripping the roof of sound historic material such as slate, clay tile, wood, and architectural metal. Applying paint or other coatings to roofing material which has been historically uncoated.
Protecting and maintaining a roof by cleaning the gutters and downspouts and replacing deteriorated flashing. Roof sheathing should also be checked for proper venting to prevent moisture condensation and water penetration; and to insure that materials are free from insect infestation.	Failing to clean and maintain gutters and downspouts properly so that water and debris collect and cause damage to roof fasteners, sheathing, and the underlying structure.
Providing adequate anchorage for roofing material to guard against wind damage and moisture penetration.	Allowing roof fasteners, such as nails and clips to corrode so that roofing material is subject to accelerated deterioration.

Roof (continued)

Recommended	Not Recommended
Protecting a leaking roof with plywood and building paper until it can be properly repaired.	Permitting a leaking roof to remain unprotected so that accelerated deterioration of historic building materials--masonry, wood, plaster, paint and structural members--occurs.
Repairing a roof by reinforcing the historic materials which comprise roof features. Repairs will also generally include the limited replacement in kind--or with compatible substitute material--of those extensively deteriorated or missing parts of features when there are surviving prototypes such as cupola louvers, dentils, dormer roofing; or slates, tiles, or wood shingles on a main roof.	Replacing an entire roof feature such as a cupola or dormer when repair of the historic materials and limited replacement of deteriorated or missing parts are appropriate.
	Using a substitute material for the replacement part that does not convey the visual appearance of the surviving parts of the roof or that is physically or chemically incompatible.
Replacing in kind an entire feature of the roof that is too deteriorated to repair--if the overall form and detailing are still evident--using the physical evidence to guide the new work. Examples can include a large section of roofing, or a dormer or chimney. If using the same kind of material is not technically or economically feasible, then a compatible substitute material may be considered.	Removing a feature of the roof that is unrepairable, such as a chimney or dormer, and not replacing it; or replacing it with a new feature that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and constructing a new feature when the historic feature is completely missing, such as a chimney or cupola. It may be an accurate restoration using historical, pictorial and physical documentation; or be a new design that is compatible with the size, scale, material, and color of the historic building.	Creating a false historical appearance because the replaced feature is based on insufficient historical, pictorial, and physical documentation.
	Introducing a new roof feature that is incompatible in size, scale, material, and color.

Roof (continued)

Recommended	Not Recommended
Alterations/Additions for the New Use	
Installing mechanical and service equipment on the roof such as air conditioning, transformers, or solar collectors when required for the new use so that they are inconspiuous from the public right-of-way and do not damage or obscure character-defining features.	Installing mechanical or service equipment so that it damages or obscures character-defining features; or is conspicuous from the public right-of-way.
Designing additions to roofs such as residential, office, or storage spaces; elevator housing; decks and terraces; or dormers or skylights when required by the new use so that they are inconspicuous from the public right-of-way and do not damage or obscure character-defining features.	Radically changing a character-defining roof shape or damaging or destroying character-defining roofing material as a result of incompatible design or improper installation techniques.

Windows

A highly decorative window with an unusual shape, or glazing pattern, or color is most likely identified immediately as a character-defining feature of the building. It is far more difficult, however, to assess the importance of repeated windows on a facade, particularly if they are individually simple in design and material, such as the large, multi-paned sash of many industrial buildings. Because rehabilitation projects frequently include proposals to replace window sash or even entire windows to improve thermal efficiency or to create a new appearance, it is essential that their contribution to the overall historic character of the building be assessed together with their physical condition before specific repair or replacement work is undertaken.

Recommended	Not Recommended
Identifying, retaining, and preserving windows--and their functional and decorative features--that are important in defining the overall historic character of the building. Such features can include frames, sash, muntins, glazing, sills, heads, hoodmolds, panelled or decorated jambs and moldings, and interior and exterior shutters and blinds.	Removing or radically changing windows which are important in defining the overall historic character of the building so that, as a result, the character is diminished.
	Changing the number, location, size or glazing pattern of windows, through cutting new openings, blocking-in windows, and installing replacement sash which does not fit the historic window opening.
	Changing the historic appearance of windows through the use of inappropriate designs, materials, finishes, or colors which radically change the sash, depth of reveal, and muntin configuration; the reflectivity and color of the glazing; or the appearance of the frame.
	Obscuring historic window trim with metal or other material.
	Stripping windows of historic material such as wood, iron, cast iron, and bronze.
Protecting and maintaining the wood and architectural metal which comprise the window frame, sash, muntins, and surrounds through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and re-application of protective coating systems.	Failing to provide adequate protection of materials on a cyclical basis so that deterioration of the windows results.

Windows (continued)

Recommended	Not Recommended
Making windows weathertight by recaulking and replacing or installing weatherstripping. These actions also improve thermal efficiency.	Retrofitting or replacing windows rather than maintaining the sash, frame, and glazing.
Evaluating the overall condition of materials to determine whether more than protection and maintenance are required, i.e. if repairs to windows and window features will be required.	Failing to undertake adequate measures to assure the preservation of historic windows.
Repairing window frames and sash by patching, splicing, consolidating or otherwise reinforcing. Such repair may also include replacement in kind of those parts that are either extensively deteriorated or are missing when there are surviving prototypes such as architraves, hoodmolds, sash, sills, and interior or exterior shutters and blinds.	Replacing an entire window when repair of materials and limited replacement of deteriorated or missing parts are appropriate. Failing to reuse serviceable window hardware such as brass lifts and sash locks. Using a substitute material for the replacement part that does not convey the visual appearance of the surviving parts of the window or that is physically or chemically incompatible.
Replacing in kind an entire window that is too deteriorated to repair--if the overall form and detailing are still evident--using the physical evidence to guide the new work. If using the same kind of material is not technically or economically feasible, then a compatible substitute material may be considered.	Removing a character-defining window that is unrepairable and blocking it in; or replacing it with a new window that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and installing new windows when the historic windows (frame, sash and glazing) are completely missing. The replacement windows may be an accurate restoration using historical, pictorial, and physical documentation; or be a new design that is compatible with the window openings and the historic character of the building.	Creating a false historical appearance because the replaced window is based on insufficient historical, pictorial, and physical documentation. Introducing a new design that is incompatible with the historic character of the building.

Windows (continued)

Recommended	Not Recommended
Alterations/Additions for the New Use	
Designing and installing additional windows on rear or other-non character-defining elevations if required by the new use. New window openings may also be cut into exposed party walls. Such design should be compatible with the overall design of the building, but not duplicate the fenestration pattern and detailing of a character-defining elevation.	Installing new windows, including frames, sash, and muntin configuration that are incompatible with the building's historic appearance or obscure, damage, or destroy character-defining features.
Providing a setback in the design of dropped ceilings when they are required for the new use to allow for the full height of the window openings.	Inserting new floors or furred-down ceilings which cut across the glazed areas of windows so that the exterior form and appearance of the windows are changed.

Entrances and Porches

Entrances and porches are quite often the focus of historic buildings, particularly when they occur on primary elevations. Together with their functional and decorative features such as doors, steps, balustrades, pilasters, and entablatures, they can be extremely important in defining the overall historic character of a building. Their retention, protection, and repair should always be carefully considered when planning rehabilitation work.

Recommended	Not Recommended
Identifying, retaining, and preserving entrances--and their functional and decorative features--that are important in defining the overall historic character of the building such as doors, fanlights, sidelights, pilasters, entablatures, columns, balustrades, and stairs.	Removing or radically changing entrances and porches which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Stripping entrances and porches of historic material such as wood, iron, cast iron, terra cotta, tile and brick. Removing an entrance or porch because the building has been re-oriented to accommodate a new use. Cutting new entrances on a primary elevation. Altering utilitarian or service entrances so they appear to be formal entrances by adding panelled doors, fanlights, and sidelights.
Protecting and maintaining the masonry, wood, and architectural metal that comprise entrances and porches through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and re-application of protective coating systems.	Failing to provide adequate protection to materials on a cyclical basis so that deterioration of entrances and porches results.
Evaluating the overall condition of materials to determine whether more than protection and maintenance are required, that is, if repairs to entrance and porch features will be necessary.	Failing to undertake adequate measures to assure the preservation of historic entrances and porches.

Entrances and Porches (continued)

Recommended	Not Recommended
Repairing entrances and porches by reinforcing the historic materials. Repair will also generally include the limited replacement in kind--or with compatible substitute material--of those extensively deteriorated or missing parts of repeated features where there are surviving prototypes such as balustrades, cornices, entablatures, columns, sidelights, and stairs.	Replacing an entire entrance or porch when the repair of materials and limited replacement of parts are appropriate. Using a substitute material for the replacement parts that does not convey the visual appearance of the surviving parts of the entrance and porch or that is physically or chemically incompatible.
Replacing in kind an entire entrance or porch that is too deteriorated to repair--if the form and detailing are still evident--using the physical evidence to guide the new work. If using the same kind of material is not technically or economically feasible, then a compatible substitute material may be considered.	Removing an entrance or porch that is unrepairable and not replacing it; or replacing it with a new entrance or porch that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features	
Designing and constructing a new entrance or porch if the historic entrance or porch is completely missing. It may be a restoration based on historical, pictorial, and physical documentation; or be a new design that is compatible with the historic character of the building.	Creating a false historical appearance because the replaced entrance or porch is based on insufficient historical, pictorial, and physical documentation. Introducing a new entrance or porch that is incompatible in size, scale, material, and color.
Alterations/Additions for the New Use	
Designing enclosures for historic porches when required by the new use in a manner that preserves the historic character of the building. This can include using large sheets of glass and recessing the enclosure wall behind existing scrollwork, posts, and balustrades.	Enclosing porches in a manner that results in a diminution or loss of historic character such as using solid materials such as wood, stucco, or masonry.

Entrances and Porches (continued)

Recommended	Not Recommended
Designing and installing additional entrances or porches when required for the new use in a manner that preserves the historic character of the building, i.e., limiting such alteration to non-character-defining elevations.	Installing secondary service entrances and porches that are incompatible in size and scale with the historic building or obscure, damage, or destroy character-defining features.

Storefronts

Storefronts are quite often the focus of historic commercial buildings and can thus be extremely important in defining the overall historic character. Because storefronts also play a crucial role in a store's advertising and merchandising strategy to draw customers and increase business, they are often altered to meet the needs of a new business. Particular care is required in planning and accomplishing work on storefronts so that the building's historic character is preserved in the process of rehabilitation.

Recommended	Not Recommended
Identifying, retaining, and preserving storefronts--and their functional and decorative features--that are important in defining the overall historic character of the building such as display windows, signs, doors, transoms, kick plates, corner posts, and entablatures.	Removing or radically changing storefronts--and their features--which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Changing the storefront so that it appears residential rather than commercial in character. Removing historic material from the storefront to create a recessed arcade. Introducing coach lanterns, mansard overhangings, wood shakes, nonoperable shutters, and small-paned windows if they cannot be documented historically. Changing the location of a storefront's main entrance.
Protecting and maintaining masonry, wood, and architectural metals which comprise storefronts through appropriate treatments such as cleaning, rust removal, limited paint removal, and reapplication of protective coating systems.	Failing to provide adequate protection to materials on a cyclical basis so that deterioration of storefront features results.
Protecting storefronts against arson and vandalism before work begins by boarding up windows and installing alarm systems that are keyed into local protection agencies.	Permitting entry into the building through unsecured or broken windows and doors so that interior features and finishes are damaged through exposure to weather or through vandalism. Stripping storefronts of historic material such as wood, cast iron, terra cotta, carrara glass, and brick.

Storefronts (continued)

Recommended	Not Recommended
Evaluating the overall condition of storefront materials to determine whether more than protection and maintenance are required, that is, if repairs to features will be necessary.	Failing to undertake adequate measures to assure the preservation of the historic storefront.
Repairing storefronts by reinforcing the historic materials. Repairs will also generally include the limited replacement in kind--or with compatible substitute material--of those extensively deteriorated or missing parts of storefronts where there are surviving prototypes such as transoms, kick plates, pilasters, or signs.	Replacing an entire storefront when repair of materials and limited replacement of its parts are appropriate. Using substitute material for the replacement parts that does not convey the same visual appearance as the surviving parts of the storefront or that is physically or chemically incompatible.
Replacing in kind an entire storefront that is too deteriorated to repair--if the overall form and detailing are still evident--using the physical evidence to guide the new work. If using the same material is not technically or economically feasible, then compatible substitute materials may be considered.	Removing a storefront that is unrepairable and not replacing it; or replacing it with a new storefront that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and constructing a new storefront when the historic storefront is completely missing. It may be an accurate restoration using historical, pictorial, and physical documentation; or be a new design that is compatible with the size, scale, material, and color of the historic building. Such new design should generally be flush with the facade; and the treatment of secondary design elements, such as awnings or signs, kept as simple as possible. For example, new signs should fit flush with the existing features of the facade, such as the fascia board or cornice.	Creating a false historical appearance because the replaced storefront is based on insufficient historical, pictorial, and physical documentation. Introducing a new design that is incompatible in size, scale, material, and color. Using new illuminated signs; inappropriately scaled signs and logos; signs that project over the sidewalk unless they were a characteristic feature of the historic building; or other types of signs that obscure, damage, or destroy remaining character-defining features of the historic building.

BUILDING INTERIOR

Structural System

If features of the structural system are exposed such as loadbearing brick walls, cast iron columns, roof trusses, posts and beams, vigas, or stone foundation walls, they may be important in defining the building's overall historic character. Unexposed structural features that are not character-defining or an entire structural system may nonetheless be significant in the history of building technology; therefore, the structural system should always be examined and evaluated early in the project planning stage to determine both its physical condition and its importance to the building's historic character or historical significance. See also Health and Safety Code Requirements.

Recommended	Not Recommended
Identifying, retaining, and preserving structural systems--and individual features of systems--that are important in defining the overall historic character of the building, such as post and beam systems, trusses, summer beams, vigas, cast iron columns, above-grade stone foundation walls, or loadbearing brick or stone walls.	Removing, covering, or radically changing features of structural systems which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Putting a new use into the building which could overload the existing structural system; or installing equipment or mechanical systems which could damage the structure. Demolishing a loadbearing masonry wall that could be augmented and retained and replacing it with a new wall (i.e., brick or stone), using the historic masonry only as an exterior veneer. Leaving known structural problems untreated such as deflection of beams, cracking and bowing of walls, or racking of structural members. Utilizing treatments or products that accelerate the deterioration of structural material such as introducing urea-formaldehyde foam insulation into frame walls.

Structural System (continued)

Recommended	Not Recommended
Protecting and maintaining the structural system by cleaning the roof gutters and downspouts; replacing roof flashing; keeping masonry, wood, and architectural metals in a sound condition; and assuring that structural members are free from insect infestation.	Failing to provide proper building maintenance on a cyclical basis so that deterioration of the structural system results.
Examining and evaluating the physical condition of the structural system and its individual features using non-destructive techniques such as X-ray photography.	Utilizing destructive probing techniques that will damage or destroy structural material.
Repairing the structural system by augmenting or upgrading individual parts or features. For example, weakened structural members such as floor framing can be spliced, braced, or otherwise supplemented and reinforced.	Upgrading the building structurally in a manner that diminishes the historic character of the exterior, such as installing strapping channels or removing a decorative cornice; or damages interior features or spaces.
	Replacing a structural member or other feature of the structural system when it could be augmented and retained.
Replacing in kind--or with substitute material--those portions or features of the structural system that are either extensively deteriorated or are missing when there are surviving prototypes such as cast iron columns, roof rafters or trusses, or sections of loadbearing walls. Substitute material should convey the same form, design, and overall visual appearance as the historic feature; and, at a minimum, be equal to its loadbearing capabilities.	Installing a replacement feature that does not convey the same visual appearance, e.g., replacing an exposed wood summer beam with a steel beam.
	Using substitute material that does not equal the loadbearing capabilities of the historic material and design or is otherwise physically or chemically incompatible.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Alterations/Additions for the New Use

Limiting any new excavations adjacent to historic foundations to avoid undermining the structural stability of the building or adjacent historic buildings.	Carrying out excavations or regrading adjacent to or within a historic building which could cause the historic foundation to settle, shift, or fail; or could have a similar effect on adjacent historic buildings.

Structural System (continued)

Recommended	Not Recommended
Correcting structural deficiencies in preparation for the new use in a manner that preserves the structural system and individual character-defining features.	Radically changing interior spaces or damaging or destroying features or finishes that are character-defining while trying to correct structural deficiencies in preparation for the new use.
Designing and installing new mechanical or electrical systems when required for the new use which minimize the number of cutouts or holes in structural members.	Installing new mechanical and electrical systems or equipment in a manner which results in numerous cuts, splices, or alterations to the structural members.
Adding a new floor when required for the new use if such an alteration does not damage or destroy the structural system or obscure, damage, or destroy character-defining spaces, features, or finishes.	Inserting a new floor when such a radical change damages a structural system or obscures or destroys interior spaces, features, or finishes. Inserting new floors or furred-down ceilings which cut across the glazed areas of windows so that the exterior form and appearance of the windows are radically changed.
Creating an atrium or a light well to provide natural light when required for the new use in a manner that assures the preservation of the structural system as well as character-defining interior spaces, features, and finishes.	Damaging the structural system or individual features; or radically changing, damaging, or destroying character-defining interior spaces, features, or finishes in order to create an atrium or a light well.

Interior: Spaces, Features, and Finishes

An interior floor plan, the arrangement of spaces, and built-in features and applied finishes may be individually or collectively important in defining the historic character of the building. Thus, their identification, retention, protection, and repair should be given prime consideration in every rehabilitation project and caution exercised in pursuing any plan that would radically change character-defining spaces or obscure, damage or destroy interior features or finishes.

Recommended	Not Recommended
Interior Spaces	
Identifying, retaining, and preserving a floor plan or interior spaces that are important in defining the overall historic character of the building. This includes the size, configuration, proportion, and relationship of rooms and corridors; the relationship of features to spaces; and the spaces themselves such as lobbies, reception halls, entrance halls, double parlors, theaters, auditoriums, and important industrial or commercial use spaces.	Radically changing a floor plan or interior spaces--including individual rooms--which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Altering the floor plan by demolishing principal walls and partitions to create a new appearance. Altering or destroying interior spaces by inserting floors, cutting through floors, lowering ceilings, or adding or removing walls. Relocating an interior feature such as a staircase so that the historic relationship between features and spaces is altered.

Recommended	Not Recommended
Interior Features and Finishes	
Identifying, retaining, and preserving interior features and finishes that are important in defining the overall historic character of the building, including columns, cornices, baseboards, fireplaces and mantels, paneling, light fixtures, hardware, and flooring; and wallpaper, plaster, paint, and finishes such as stenciling, marbling, and graining; and other decorative materials that accent interior features and provide color, texture, and patterning to walls, floors, and ceilings.	Removing or radically changing features and finishes which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Installing new decorative material that obscures or damages character-defining interior features or finishes. Removing paint, plaster, or other finishes from historically finished surfaces to create a new appearance (e.g., removing plaster to expose masonry surfaces such as brick walls or a chimney piece). Applying paint, plaster, or other finishes to surfaces that have been historically unfinished to create a new appearance. Stripping historically painted wood surfaces to bare wood, then applying clear finishes or stains to create a "natural look." Stripping paint to bare wood rather than repairing or reapplying grained or marbled finishes to features such as doors and paneling. Radically changing the type of finish or its color, such as painting a previously varnished wood feature.
Protecting and maintaining masonry, wood, and architectural metals which comprise interior features through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and reapplication of protective coatings systems.	Failing to provide adequate protection to materials on a cyclical basis so that deterioration of interior features results.

Interior Features and Finishes (continued)

Recommended	Not Recommended
Protecting interior features and finishes against arson and vandalism before project work begins, erecting protective fencing, boarding-up windows, and installing fire alarm systems that are keyed to local protection agencies.	Permitting entry into historic buildings through unsecured or broken windows and doors so that interior features and finishes are damaged by exposure to weather or through vandalism. Stripping interiors of features such as woodwork, doors, windows, light fixtures, copper piping, radiators; or of decorative materials.
Protecting interior features such as a staircase, mantel, or decorative finishes and wall coverings against damage during project work by covering them with heavy canvas or plastic sheets.	Failing to provide proper protection of interior features and finishes during work so that they are gouged, scratched, dented, or otherwise damaged.
Installing protective coverings in areas of heavy pedestrian traffic to protect historic features such as wall coverings, parquet flooring and panelling.	Failing to take new use patterns into consideration so that interior features and finishes are damaged.
Removing damaged or deteriorated paints and finishes to the next sound layer using the gentlest method possible, then repainting or refinishing using compatible paint or other coating systems.	Using destructive methods such as propane or butane torches or sandblasting to remove paint or other coatings. These methods can irreversibly damage the historic materials that comprise interior features.
Repainting with colors that are appropriate to the historic building.	Using new paint colors that are inappropriate to the historic building.
Limiting abrasive cleaning methods to certain industrial or warehouse buildings where the interior masonry or plaster features do not have distinguishing design, detailing, tooling, or finishes; and where wood features are not finished, molded, beaded, or worked by hand. Abrasive cleaning should only be considered after other, gentler methods have been proven ineffective.	Changing the texture and patina of character-defining features through sandblasting or use of other abrasive methods to remove paint, discoloration or plaster. This includes both exposed wood (including structural members) and masonry.
Evaluating the overall condition of materials to determine whether more than protection and maintenance are required, that is, if repairs to interior features and finishes will be necessary.	Failing to undertake adequate measures to assure the preservation of interior features and finishes.

Interior Features and Finishes (continued)

Recommended	Not Recommended
Repairing interior features and finishes by reinforcing the historic materials. Repair will also generally include the limited replacement in kind--or with compatible substitute material--of those extensively deteriorated or missing parts of repeated features when there are surviving prototypes such as stairs, balustrades, wood panelling, columns; or decorative wall coverings or ornamental tin or plaster ceilings.	Replacing an entire interior feature such as a staircase, panelled wall, parquet floor, or cornice; or finish such as a decorative wall covering or ceiling when repair of materials and limited replacement of such parts are appropriate. Using a substitute material for the replacement part that does not convey the visual appearance of the surviving parts or portions of the interior feature or finish or that is physically or chemically incompatible.
Replacing in kind an entire interior feature or finish that is too deteriorated to repair--if the overall form and detailing are still evident--using the physical evidence to guide the new work. Examples could include wainscoting, a tin ceiling, or interior stairs. If using the same kind of material is not technically or economically feasible, then a compatible substitute material may be considered.	Removing a character-defining feature or finish that is unrepairable and not replacing it; or replacing it with a new feature or finish that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and installing a new interior feature or finish if the historic feature or finish is completely missing. This could include missing partitions, stairs, elevators, lighting fixtures, and wall coverings; or even entire rooms if all historic spaces, features, and finishes are missing or have been destroyed by inappropriate "renovations." The design may be a restoration based on historical, pictorial, and physical documentation; or be a new design that is compatible with the historic character of the building, district, or neighborhood.	Creating a false historical appearance because the replaced feature is based on insufficient physical, historical, and pictorial documentation or on information derived from another building. Introducing a new interior feature or finish that is incompatible with the scale, design, materials, color, and texture of the surviving interior features and finishes.

Interior Features and Finishes (continued)

Recommended	Not Recommended
Alterations/Additions for the New Use	
Accommodating service functions such as bathrooms, mechanical equipment, and office machines required by the building's new use in secondary spaces such as first floor service areas or on upper floors.	Dividing rooms, lowering ceilings, and damaging or obscuring character-defining features such as fireplaces, niches, stairways or alcoves, so that a new use can be accommodated in the building.
Reusing decorative material or features that have had to be removed during the rehabilitation work including wall and baseboard trim, door moulding, panelled doors, and simple wainscoting; and relocating such material or features in areas appropriate to their historic placement.	Discarding historic material when it can be reused within the rehabilitation project or relocating it in historically inappropriate areas.
Installing permanent partitions in secondary spaces; removable partitions that do not destroy the sense of space should be installed when the new use requires the subdivision of character-defining interior spaces.	Installing permanent partitions that damage or obscure character-defining spaces, features, or finishes.
Enclosing an interior stairway where required by code so that its character is retained. In many cases, glazed fire-rated walls may be used.	Enclosing an interior stairway with fire-rated construction so that the stairwell space or any character-defining features are destroyed.
Placing new code-required stairways or elevators in secondary and service areas of the historic building.	Radically changing, damaging, or destroying character-defining spaces, features, or finishes when adding new code-required stairways and elevators.
Creating an atrium or a light well to provide natural light when required for the new use in a manner that preserves character-defining interior spaces, features, and finishes as well as the structural system.	Destroying character-defining interior spaces, features, or finishes; or damaging the structural system in order to create an atrium or light well.
Adding a new floor if required for the new use in a manner that preserves character-defining structural features, and interior spaces, features, and finishes.	Inserting a new floor within a building that alters or destroys the fenestration; radically changes a character-defining interior space; or obscures, damages, or destroys decorative detailing.

Mechanical Systems: Heating, Air Conditioning, Electrial, and Plumbing

The visible features of historic heating, lighting, air conditioning and plumbing systems may sometimes help define the overall historic character of the building and should thus be retained and repaired, whenever possible. The systems themselves (the compressors, boilers, generators and their ductwork, wiring and pipes) will generally either need to be upgraded, augmented, or entirely replaced in order to accommodate the new use and to meet code requirements. Less frequently, individual portions of a system or an entire system are significant in the history of building technology; therefore, the identification of character-defining features or historically significant systems should take place together with an evaluation of their physical condition early in project planning.

Recommended	Not Recommended
Identifying, retaining, and preserving visible features of early mechanical systems that are important in defining the overall historic character of the building, such as radiators, vents, fans, grilles, plumbing fixtures, switchplates, and lights.	Removing or radically changing features of mechanical systems that are important in defining the overall historic character of the building so that, as a result, the character is diminished.
Protecting and maintaining mechanical, plumbing, and electrical systems and their features through cyclical cleaning and other appropriate measures.	Failing to provide adequate protection of materials on a cyclical basis so that deterioration of mechanical systems and their visible features results.
Preventing accelerated deterioration of mechanical systems by providing adequate ventilation of attics, crawlspaces, and cellars so that moisture problems are avoided.	Enclosing mechanical systems in areas that are not adequately ventilated so that deterioration of the systems results.
Repairing mechanical systems by augmenting or upgrading system parts, such as installing new pipes and ducts; rewiring; or adding new compressors or boilers.	Replacing a mechanical system or its functional parts when it could be upgraded and retained.

Mechanical Systems (continued)

Recommended	Not Recommended
Replacing in kind--or with compatible substitute material--those visible features of mechanical systems that are either extensively deteriorated or are missing when there are surviving prototypes such as ceiling fans, switchplates, radiators, grilles, or plumbing fixtures.	Installing a replacement feature that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Alterations/Additions for the New Use

Installing a completely new mechanical system if required for the new use so that it causes the least alteration possible to the building's floor plan, the exterior elevations, and the least damage to historic building material.	Installing a new mechanical system so that character-defining structural or interior features are radically changed, damaged, or destroyed.
Installing the vertical runs of ducts, pipes, and cables in closets, service rooms, and wall cavities.	Installing vertical runs of ducts, pipes, and cables in places where they will obscure character-defining features. Concealing mechanical equipment in walls or ceilings in a manner that requires the removal of historic building material. Installing "dropped" acoustical ceilings to hide mechanical equipment when this destroys the proportions of character-defining interior spaces.
Installing air conditioning units if required by the new use in such a manner that the historic materials and features are not damaged or obscured.	Cutting through features such as masonry walls in order to install air conditioning units.
Installing heating/air conditioning units in the window frames in such a manner that the sash and frames are protected. Window installations should be considered only when all other viable heating/cooling systems would result in significant damage to historic materials.	Radically changing the appearance of the historic building or damaging or destroying windows by installing heating/air conditioning units in historic window frames.

BUILDING SITE

The relationship between a historic building or buildings and landscape features within a property's boundaries--or the building site--helps to define the historic character and should be considered an integral part of overall planning for rehabilitation project work.

Recommended	Not Recommended
Identifying, retaining, and preserving buildings and their features as well as features of the site that are important in defining its overall historic character. Site features can include driveways, walkways, lighting, fencing, signs, benches, fountains, wells, terraces, canal systems, plants and trees, berms, and drainage or irrigation ditches; and archeological features that are important in defining the history of the site.	Removing or radically changing buildings and their features or site features which are important in defining the overall historic character of the building site so that, as a result, the character is diminished.
Retaining the historic relationship between buildings, landscape features, and open space.	Removing or relocating historic buildings or landscape features, thus destroying the historic relationship between buildings, landscape features, and open space. Removing or relocating historic buildings on a site or in a complex of related historic structures--such as a mill complex or farm--thus diminishing the historic character of the site or complex. Moving buildings onto the site, thus creating a false historical appearance. Lowering the grade level adjacent to a building to permit development of a formerly below-grade area such as a basement in a manner that would drastically change the historic relationship of the building to its site.
Protecting and maintaining buildings and the site by providing proper drainage to assure that water does not erode foundation walls; drain toward the building; nor erode the historic landscape.	Failing to maintain site drainage so that buildings and site features are damaged or destroyed; or, alternatively, changing the site grading so that water no longer drains properly.

BUILDING SITE (continued)

Recommended	Not Recommended
Minimizing disturbance of terrain around buildings or elsewhere on the site, thus reducing the possibility of destroying unknown archeological materials.	Introducing heavy machinery or equipment into areas where their presence may disturb archeological materials.
Surveying areas where major terrain alteration is likely to impact important archeological sites.	Failing to survey the building site prior to the beginning of rehabilitation project work so that, as a result, important archeological material is destroyed.
Protecting, e.g. preserving in place known archeological material whenever possible.	Leaving known archeological material unprotected and subject to vandalism, looting, and destruction by natural elements such as erosion.
Planning and carrying out any necessary investigation using professional archeologists and modern archeological methods when preservation in place is not feasible.	Permitting unqualified project personnel to perform data recovery so that improper methodology results in the loss of important archeological material.
Protecting the building and other features of the site against arson and vandalism before rehabilitation work begins, i.e., erecting protective fencing and installing alarm systems that are keyed into local protection agencies.	Permitting buildings and site features to remain unprotected so that plant materials, fencing, walkways, archeological features, etc. are damaged or destroyed. Stripping features from buildings and the site such as wood siding, iron fencing, masonry balustrades; or removing or destroying landscape features, including plant material.
Providing continued protection of masonry, wood, and architectural metals which comprise building and site features through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and re-application of protective coating systems; and continued protection and maintenance of landscape features, including plant material.	Failing to provide adequate protection of materials on a cyclical basis so that deterioration of building and site features results.
Evaluating the overall condition of materials to determine whether more than protection and maintenance are required, that is, if repairs to building and site features will be necessary.	Failing to undertake adequate measures to assure the preservation of building and site features.

BUILDING SITE (continued)

Recommended	Not Recommended
Repairing features of buildings and the site by reinforcing the historic materials. Repair will also generally include replacement in kind--with a compatible substitute material--of those extensively deteriorated or missing parts of features where there are surviving prototypes such as fencing and paving.	Replacing an entire feature of the building or site such as a fence, walkway, or driveway when repair of materials and limited replacement of deteriorated or missing parts are appropriate. Using a substitute material for the replacement part that does not convey the visual appearance of the surviving parts of the building or site feature or that is physically or chemically incompatible.
Replacing in kind an entire feature of the building or site that is too deteriorated to repair--if the overall form and detailing are still evident--using the physical evidence to guide the new work. This could include an entrance or porch, walkway, or fountain. If using the same kind of material is not technically or economically feasible, then a compatible substitute material may be considered.	Removing a feature of the building or site that is unrepairable and not replacing it; or replacing it with a new feature that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation project work and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and constructing a new feature of a building or site when the historic feature is completely missing, such as an outbuilding, terrace, or driveway. It may be based on historical, pictorial, and physical documentation; or be a new design that is compatible with the historic character of the building and site.	Creating a false historical appearance because the replaced feature is based on insufficient historical, pictorial, and physical documentation. Introducing a new building or site feature that is out of scale or otherwise inappropriate. Introducing a new landscape feature or plant material that is visually incompatible with the site or that destroys site patterns or vistas.

BUILDING SITE (continued)

Recommended	Not Recommended
Alterations/Additions for the New Use	
Designing new onsite parking, loading docks, or ramps when required by the new use so that they are as unobtrusive as possible and assure the preservation of character-defining features of the site.	Placing parking facilities directly adjacent to historic buildings where automobiles may cause damage to the buildings or landscape features or be intrusive to the building site.
Designing new exterior additions to historic buildings or adjacent new construction which is compatible with the historic character of the site and which preserve the historic relationship between a building or buildings, landscape features, and open space.	Introducing new construction onto the building site which is visually incompatible in terms of size, scale, design, materials, color and texture or which destroys historic relationships on the site.
Removing nonsignificant buildings, additions, or site features which detract from the historic character of the site.	Removing a historic building in a complex, a building feature, or a site feature which is important in defining the historic character of the site.

DISTRICT/NEIGHBORHOOD The relationship between historic buildings, and streetscape and landscape features within a historic district or neighborhood helps to define the historic character and therefore should always be a part of the rehabilitation plans.

Recommended	Not Recommended
Identifying, retaining, and preserving buildings, and streetscape, and landscape features which are important in defining the overall historic character of the district or neighborhood. Such features can include streets, alleys, paving, walkways, street lights, signs, benches, parks and gardens, and trees.	Removing or radically changing those features of the district or neighborhood which are important in defining the overall historic character so that, as a result, the character is diminished.
Retaining the historic relationship between buildings, and streetscape and landscape features such as a town square comprised of row houses and stores surrounding a communal park or open space.	Destroying streetscape and landscape features by widening existing streets, changing paving material, or introducing inappropriately located new streets or parking lots. Removing or relocating historic buildings, or features of the streetscape and landscape, thus destroying the historic relationship between buildings, features and open space.
Protecting and maintaining the historic masonry, wood, and architectural metals which comprise building and streetscape features, through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and reapplication of protective coating systems; and protecting and maintaining landscape features, including plant material.	Failing to provide adequate protection of materials on a cyclical basis so that deterioration of building, streetscape, and landscape features results.
Protecting buildings, paving, iron fencing, etc. against arson and vandalism before rehabilitation work begins by erecting protective fencing and installing alarm systems that are keyed into local protection agencies.	Permitting buildings to remain unprotected so that windows are broken; and interior features are damaged. Stripping features from buildings or the streetscape such as wood siding, iron fencing, or terra cotta balusters; or removing or destroying landscape features, including plant material.

DISTRICT/NEIGHBORHOOD (continued)

Recommended	Not Recommended
Evaluating the overall condition of building, streetscape and landscape materials to determine whether more than protection and maintenance are required, that is, if repairs to features will be necessary.	Failing to undertake adequate measures to assure the preservation of building, streetscape, and landscape features.
Repairing features of the building, streetscape, or landscape by reinforcing the historic materials. Repair will also generally include the replacement in kind--or with a compatible substitute material--of those extensively deteriorated or missing parts of features when there are surviving prototypes such as porch balustrades, paving materials, or streetlight standards.	Replacing an entire feature of the building, streetscape, or landscape such as a porch, walkway, or streetlight, when repair of materials and limited replacement of deteriorated or missing parts are appropriate. Using a substitute material for the replacement part that does not convey the visual appearance of the surviving parts of the building, streetscape, or landscape feature or that is physically or chemically incompatible.
Replacing in kind an entire feature of the building, streetscape, or landscape that is too deteriorated to repair--when the overall form and detailing are still evident--using the physical evidence to guide the new work. This could include a storefront, a walkway, or a garden. If using the same kind of material is not technically or economically feasible, then a compatible substitute material may be considered.	Removing a feature of the building, streetscape, or landscape that is unrepairable and not replacing it; or replacing it with a new feature that does not convey the same visual appearance.

The following work is highlighted to indicate that it represents the particularly complex technical or design aspects of rehabilitation projects and should only be considered after the preservation concerns listed above have been addressed.

Design for Missing Historic Features

Designing and constructing a new feature of the building, streetscape, or landscape when the historic feature is completely missing, such as row house steps, a porch, streetlight, or terrace. It may be a restoration based on historical, pictorial, and physical documentation; or be a new design that is compatible with the historic character of the district or neighborhood.	Creating a false historical appearance because the replaced feature is based on insufficient historical, pictorial and physical documentation. Introducing a new building, streetscape or landscape feature that is out of scale or otherwise inappropriate to the setting's historic character, e.g., replacing picket fencing with chain link fencing.

DISTRICT/NEIGHBORHOOD (continued)

Recommended	Not Recommended
Alterations/Additions for the New Use	
Designing required new parking so that it is as unobtrusive as possible, i.e., on side streets or at the rear of buildings. "Shared" parking should also be planned so that several businesses can utilize one parking area as opposed to introducing random, multiple lots.	Placing parking facilities directly adjacent to historic buildings which cause the removal of historic plantings, relocation of paths and walkways, or blocking of alleys.
Designing and constructing new additions to historic buildings when required by the new use. New work should be compatible with the historic character of the district or neighborhood in terms of size, scale, design, material, color, and texture.	Introducing new construction into historic districts that is visually incompatible or that destroys historic relationships within the district or neighborhood.
Removing nonsignificant buildings, additions, or streetscape and landscape features which detract from the historic character of the district or the neighborhood.	Removing a historic building, building feature, or landscape or streetscape feature that is important in defining the overall historic character of the district or the neighborhood.

HEALTH AND SAFETY CODE REQUIREMENTS

As a part of the new use, it is often necessary to make modifications to a historic building so that it can comply with current health, safety and code requirements. Such work needs to be carefully planned and undertaken so that it does not result in a loss of character-defining spaces, features, and finishes.

Recommended	Not Recommended
Identifying the historic building's character-defining spaces, features, and finishes so that code-required work will not result in their damage or loss.	Undertaking code-required alterations to a building or site before identifying those spaces, features, or finishes which are character-defining and must therefore be preserved.
Complying with health and safety codes, including seismic codes and barrier-free access requirements, in such a manner that character-defining spaces, features, and finishes are preserved.	Altering, damaging, or destroying character-defining spaces, features, and finishes while making modifications to a building or site to comply with safety codes.
Working with local code officials to investigate alternative life safety measures or variances available under some codes so that alterations and additions to historic buildings can be avoided.	Making changes to historic buildings without first seeking alternatives to code requirements.
Providing barrier-free access through removable or portable, rather than permanent, ramps.	Installing permanent ramps that damage or diminish character-defining features.
Providing seismic reinforcement to a historic building in a manner that avoids damaging the structural system and character-defining features.	Reinforcing a historic building using measures that damage or destroy character-defining structural and other features.
Upgrading historic stairways and elevators to meet health and safety codes in a manner that assures their preservation, i.e., so that they are not damaged or obscured.	Damaging or obscuring historic stairways and elevators or altering adjacent spaces in the process of doing work to meet code requirements.
Installing sensitively designed fire suppression systems, such as a sprinkler system for wood frame mill buildings, instead of applying fire-resistant sheathing to character-defining features.	Covering character-defining wood features with fire-resistant sheathing which results in altering their visual appearance.

HEALTH AND SAFETY CODE REQUIREMENTS (continued)

Recommended	Not Recommended
Applying fire-retardant coatings, such as intumescent paints, which expand during fire to add thermal protection to steel.	Using fire-retardant coatings if they damage or obscure character-defining features.
Adding a new stairway or elevator to meet health and safety codes in a manner that preserves adjacent character-defining features and spaces.	Radically changing, damaging, or destroying character-defining spaces, features, or finishes when adding a new code-required stairway or elevator.
Placing a code-required stairway or elevator that cannot be accommodated within the historic building in a new exterior addition. Such an addition should be located at the rear of the building or on an inconspicuous side; and its size and scale limited in relationship to the historic building.	Constructing a new addition to accommodate code-required stairs and elevators on character-defining elevations highly visible from the street; or where it obscures, damages or destroys character-defining features.

ENERGY RETROFITTING

Some character-defining features of a historic building or site such as cupolas, shutters, transoms, skylights, sun rooms, porches, and plantings also play a secondary energy conserving role. Therefore, prior to retrofitting historic buildings to make them more energy efficient, the first step should always be to identify and evaluate the existing historic features to assess their inherent energy conserving potential. If it is determined that retrofitting measures are necessary, then such work needs to be carried out with particular care to insure that the building's historic character is preserved in the the process of rehabilitation.

Recommended	Not Recommended
District/Neighborhood	
Maintaining those existing landscape features which moderate the effects of the climate on the setting such as deciduous trees, evergreen wind-blocks, and lakes or ponds.	Stripping the setting of landscape features and landforms so that the effects of the wind, rain, and the sun result in accelerated deterioration of historic materials.
Building Site	
Retaining plant materials, trees, and landscape features, especially those which perform passive solar energy functions such as sun shading and wind breaks.	Removing plant materials, trees, and landscape features, so that they no longer perform passive solar energy functions.
Installing freestanding solar collectors in a manner that preserves the historic property's character-defining features.	Installing freestanding solar collectors that obscure, damage, or destroy historic landscape or archeological features.
Designing attached solar collectors, including solar greenhouses, so that the character-defining features of the property are preserved.	Locating solar collectors where they radically change the property's appearance; or damage or destroy character-defining features.

ENERGY RETROFITTING (continued)

Recommended	Not Recommended
Masonry/Wood/Architectural Metals	
Installing thermal insulation in attics and in unheated cellars and crawlspaces to increase the efficiency of the existing mechanical systems.	Applying urea formaldehyde foam or any other thermal insulation with a water content into wall cavities in an attempt to reduce energy consumption.
Installing insulating material on the inside of masonry walls to increase energy efficiency where there is no character-defining interior moulding around the window or other interior architectural detailing.	Resurfacing historic building materials with more energy efficient but incompatible materials, such as covering historic masonry with exterior insulation.
Installing passive solar devices such as a glazed "trombe" wall on a rear or inconspicuous side of the historic building.	Installing passive solar devices such as an attached glazed "trombe" wall on primary or other highly visible elevations; or where historic material must be removed or obscured.
Roofs	
Placing solar collectors on non-character-defining roofs or roofs of nonhistoric adjacent buildings.	Placing solar collectors on roofs when such collectors change the historic roofline or obscure the relationship of the roof to character-defining roof features such as dormers, skylights, and chimneys.
Windows	
Utilizing the inherent energy conserving features of a building by maintaining windows and louvered blinds in good operable condition for natural ventilation.	Removing historic shading devices rather than keeping them in an operable condition.
Improving thermal efficency with weatherstripping, storm windows, caulking, interior shades, and, if historically appropriate, blinds and awnings.	Replacing historic multi-paned sash with new thermal sash utilizing false muntins.
Installing interior storm windows with air-tight gaskets, ventilating holes, and/or removable clips to insure proper maintenance and to avoid condensation damage to historic windows.	Installing interior storm windows that allow moisture to accumulate and damage the window.

ENERGY RETROFITTING
Windows (continued)

Recommended	Not Recommended
Windows (continued)	
Installing exterior storm windows which do not damage or obscure the windows and frames.	Installing new exterior storm windows which are inappropriate in size or color, which are inoperable.
	Replacing windows or transoms with fixed thermal glazing or permitting windows and transoms to remain inoperable rather than utilizing them for their energy conserving potential.
Considering the use of lightly tinted glazing on non-character-defining elevations if other energy retrofitting alternatives are not possible.	Using tinted or reflective glazing on character-defining or other conspicuous elevations.
Entrances and Porches	
Utilizing the inherent energy conserving features of a building by maintaining porches, and double vestibule entrances, in good condition so that they can retain heat or block the sun and provide natural ventilation.	Enclosing porches located on character-defining elevations to create passive solar collectors or airlock vestibules. Such enclosures can destroy the historic appearance of the building.
Interior Features	
Retaining historic interior shutters and transoms for their inherent energy conserving features.	Removing historic interior features which play a secondary energy conserving role.
New Additions to Historic Buildings	
Placing new additions that have an energy conserving function such as a solar greenhouse on non-character-defining elevations.	Installing new additions such as multi-story solar greenhouse additions which obscure, damage, destroy character-defining features.
Mechanical Systems	
Installing thermal insulation in attics and in unheated cellars and crawlspaces to conserve energy.	Applying urea formaldehyde foam or any other thermal insulation with a water content or that may collect moisture into wall cavities.

NEW ADDITIONS TO HISTORIC BUILDINGS

An attached exterior addition to a historic building expands its "outer limits" to create a new profile. Because such expansion has the capability to radically change the historic appearance, an exterior addition should be considered only after it has been determined that the new use cannot be successfully met by altering non-character-defining interior spaces. If the new use cannot be met in this way, then an attached exterior addition is usually an acceptable alternative. New additions should be designed and constructed so that the character-defining features of the historic building are not radically changed, obscured, damaged, or destroyed in the process of rehabilitation. New design should always be clearly differentiated so that the addition does not appear to be part of the historic resource.

Recommended	Not Recommended
Placing functions and services required for the new use in non-character-defining interior spaces rather than installing a new addition.	Expanding the size of the historic building by constructing a new addition when the new use could be met by altering non-character-defining interior spaces.
Constructing a new addition so that there is the least possible loss of historic materials and so that character-defining features are not obscured, damaged, or destroyed.	Attaching a new addition so that the character-defining features of the historic building are obscured, damaged, or destroyed.
Locating the attached exterior addition at the rear or on an inconspicuous side of a historic building; and limiting its size and scale in relationship to the historic building.	Designing a new addition so that its size and scale in relation to the historic building are out of proportion, thus diminishing the historic character.
Designing new additions in a manner that makes clear what is historic and what is new.	Duplicating the exact form, material, style, and detailing of the historic building in the new addition so that the new work appears to be part of the historic building.
	Imitating a historic style or period of architecture in new additions, especially for contemporary uses such as drive-in banks or garages.

NEW ADDITIONS TO HISTORIC BUILDINGS (continued)

Recommended	Not Recommended
Considering the attached exterior addition both in terms of the new use and the appearance of other buildings in the historic district or neighborhood. Design for the new work may be contemporary or may reference design motifs from the historic building. In either case, it should always be clearly differentiated from the historic building and be compatible in terms of mass, materials, relationship of solids to voids, and color.	Designing and constructing new additions that result in the diminution or loss of the historic character of the resource, including its design, materials, workmanship, location, or setting. Using the same wall plane, roof line, cornice height, materials, siding lap or window type to make additions appear to be a part of the historic building.
Placing new additions such as balconies and greenhouses on non-character-defining elevations and limiting the size and scale in relationship to the historic building.	Designing new additions such as multi-story greenhouse additions that obscure, damage, or destroy character-defining features of the historic building.
Designing additional stories, when required for the new use, that are set back from the wall plane and are as inconspicuous as possible when viewed from the street.	Constructing additional stories so that the historic appearance of the building is radically changed.

REFERENCES

AUSTIN, RICHARD L.
1984 Designing the Natural Landscape. Van Nostrand Reinhold Co., Inc.

CITY OF OAKLAND PLANNING DEPARTMENT
1978 "Rehab Right: How to Rehabilitate Your Oakland House Without Sacrificing Architectural Assets. Oakland, CA.

COOPERATING EXTENSION SERVICE AND ALASKA STATE DEPARTMENT OF COMMUNITY AND REGIONAL AFFAIRS OFFICE OF ENERGY PROGRAMS
1987 "Alaska Craftsman Home Building Manual."

COUNCIL OF AMERICAN BUILDING OFFICIALS
1986 "One and Two Family Dwelling Code."

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
1970 "Operation Breakthrough." Request for proposal H-55-69.

1974 "A Guide to Airborne, Impact, and Structureborne Noise Control in Multifamily Dwellings." TS-24.

1980 "Rehabilitation Guidelines," vols 1-8. Government Printing Office, Washington, D.C.

1984 "Minimum Property Standards for One- and Two-Family Dwellings."

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT/DEPARTMENT OF ENERGY
1978 "Regional Guidelines for Building Passive Energy Conserving Homes," by AIA Research Corporation for HUD/DOE (contract H2384).

DIEDELMANN, JOHN, AND ROBERT SCHUSTER
1982 Natural Landscaping. McGraw-Hill, Inc.

GENERAL SERVICES ADMINISTRATION, DEPARTMENT OF DEFENCE, DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, U.S. POSTAL SERVICE
1985 Uniform Federal Accessibility Standards.

HERITAGE CONSERVATION AND RECREATION SERVICE, U.S. DEPARTMENT OF THE INTERIOR
1979 "Preservation Case Studies." Division of Technical Preservation Services.

LANDPHAIR, HARLOW C., AND FRED KLATT, JR.
1979 Landscape Architecture Construction. Elsevier North Holland, Inc.

LYNCH, KEVIN, AND GARY HACK
1984 Site Planning, 3rd ed. MIT Press.

NATIONAL PARK SERVICE, U.S. DEPARTMENT OF THE INTERIOR
1979-present "Preservation Briefs" nos. 1-15. Government Printing Office, Washington, D.C.

1981 Energy Conservation and Solar Energy for Historic Buildings, by Thomas Vonier Associates. Government Printing Office, Washington, D.C.

1983 "Accommodation of Disabled Visitors at Historic Sites in the National Park System," by Duncan S. Ballantyne, Park Historic Architecture Division, Cultural Resources Management. Government Printing Office, Washington, D.C.

1984 Cultural Landscapes: Rural Historic Districts in the National Park System, by Robert E. Melnick. Government Printing Office, Washington, D.C.

1987 "Primary Work Elements, FY 88."

1987 "National Register Bulletin," no. 18. "How to Evaluate and Nominate Designed Historic Landscapes" by Timothy Keller and Genevieve P. Keller of Land and Community Associates, Charlottesville, Virginia. Government Printing Office, Washington, D.C.

NATIONAL TRUST FOR HISTORIC PRESERVATION
1980 Old and New Architecture: Design Relationships, The Preservation Press, Inc. Washington, D.C.

1981 New Energy from Old Buildings. The Preservation Press, Inc. Washington, D.C.

OLD HOUSE JOURNAL
Old House Journal Corp., Inc. Brooklyn, N.Y.

PACKARD, ROBERT T., AIA ED.
1981 Architectural Graphic Standards (Ramsey/Sleeper), 7th ed. John Wiley and Sons, Inc.

ROBINETTE, GARY O., AND CHARLES MCCLENNON
1983 Landscape Planning for Energy Conservation. Van Nostrand Reinhold Co., Inc.

SEDDON, JOHN, AND ANTHONY CORKILL
1976 Manual: Design and Control of Land Development in Suburban Communities, 3rd ed. The Institute of Rational Design, Inc.

SIMONDS, JOHN ORMSBEE
1983 Landscape Architecture, 2nd ed. McGraw-Hill, Inc.

SMARDON, RICHARD C. et al.
1986 Foundations for Visual Project Analysis. John Wiley and Sons.

SMYSER, CAROL A.
1982 Nature's Design. Rodale Press, Inc.

VILA, ROBERT AND JANE DAVISON
1980 This Old House: Restoring, Rehabilitating, and Renovating. Little, Brown and Co.

WATKINS, A.M.
1984 A Complete Guide to Factory-Made Houses. The Building Institute/Caroline House, Inc.

WRIGHT, DAVID
1982 Passive Solar Architecture. Van Nostrand Reinhold Co., Inc.

1984 Natural Solar Architecture. Van Nostrand Reinhold Co., Inc.